



MODERN WORLD GEOGRAPHY

Economic and Social

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PREFACE

What is geography? Geography is a study of human activities as related to environment. Shakespeare has said: "All the world's a stage and all the men and women merely players." This oft-repeated statement suggests the very nature of geographic study. Geography is concerned with the way in which peoples live in various parts of the world. But the stage or natural scene is not the same in all parts of the world. It varies markedly from one place to another because of the inequalities or differences in (1) climate, (2) topography, (3) resources, and (4) accessibility.

Although the world is the stage, the natural scene is modified by man. It will be seen that man writes part of the drama and helps set the stage; nature writes some of the lines and designs much of the scenery. Nature makes the scene a desert, man changes it to a beautiful and productive irrigated garden. Nature, however, must supply accessible water before man can make the change. Nature makes the natural scene a forest; man changes it into agricultural land. In many other ways man is constantly changing the natural scene in many parts of the world.

The problems of planning and arranging the scenery for dramas as they are enacted in the theater are markedly different from the problems of planning and arranging the scenery for the drama of life. In the theater the players know their lines and the stage can be set accordingly. In life many of the comedies, tragedies, and other dramatic scenes are thrust on man without his having an opportunity to shift the scenery to suit his needs.

In life the farmer may hope that at the proper time his lines will read:

And the land was blessed with a plentiful supply of rain, with proper amounts of sunshine, and with gentle breezes. Bountiful crops were harvested; pastures were excellent; and the cattle, horses, and other livestock were well fed and contented. All nature seemed to smile on a happy and prosperous people.

PREFACE

The farmer spends months in setting the stage for such lines. He plows the land, plants the crops, and cultivates the fields, builds granaries, and makes all preparations for the part he hopes to play. But a tragic role in the drama of life is suddenly thrust upon him. Nature changes the lines to read,

And the sky remained cloudless week after week, the scorching heat of the sun caused the vegetation to wither and die, heavy clouds of black dust filled the air; and heartaches, hunger, suffering, and despair gripped the drought-ridden area. Everywhere tragedy stalked the land.

Nature not only rewrote the lines but it changed the scenery. Instead of the stage being set with bountiful crops, fat cattle browsing in green pastures, and happy children playing about well-kept homes, the scene was that of a drab and barren waste which yields little else than sorrow, suffering, and other human ills.

Thus it is seen that the world is the stage for human action. Both man and environment take part in writing the lines, in designing the scenery, and in arranging the stage for the drama of life. *The study of the relationship between human action and the natural environment is the very heart of geography.*

The better man understands his natural environment, the better can he prepare for this great drama—living. If the citrus fruit-grower realizes that frost may kill his orange and lemon crops, he can prepare to heat the orchard during periods of frost. If the farmer knows that the weather in his particular area is unreliable he can plant drought-resistant crops or in other ways make provision that will, at least in part, offset the weather hazards. If the steel manufacturer knows the amount of iron ore in the particular deposit upon which he is depending for raw materials he can make his plans accordingly. If the architect knows that the skyscraper which he is designing is to be erected within an earthquake zone, he can have it built in such a manner and of such materials as to be relatively resistant to earthquake shocks.

Literally thousands of examples could be given to show how man may overcome, at least in part, the disadvantages of a natural environment. Thousands of examples could also be given to show how man can further improve an excellent natural environment.

PREFACE

Purpose of this text. The purpose of this book is to give the student an understanding of the advantages and disadvantages of the various parts of the world as the home of man. The world is so large and the time given to geography in secondary schools is so limited that the subject of world geography cannot be covered completely. The authors have, accordingly, given great care to the selection of materials for study.

The number of regions and industries studied in the text has been limited to such an extent that each subject has been treated fully enough to give it richness of meaning. Such a method of treatment has compelled the authors to omit many sections of the more sparsely populated parts of the world. Also many industries of the United States have been omitted. These regions and industries may be assigned as special problems in those schools where time and library facilities permit.

The United States is given major attention. The space given to other parts of the world is somewhat in proportion to their importance to the American people. Careful attention has been given to the importance of foreign lands to American well-being. Thus three chapters are given to the hot, wet lands of the world, when consideration is given to our great dependence upon these areas, it is found that three chapters are not an undue amount of space for their treatment.

The authors have studiously avoided any encyclopedic treatment of subjects. Statistics have been used sparingly and primarily to illustrate trends or to explain principles. The text is devoted primarily to the study of *causes* and *effects*, and the authors have at all times given careful attention to the relation of environment to human well-being. In fact, *human well-being as related to environment* is the central theme of the text.

Care has been taken in the choice of maps and illustrations, both as to size and to placement. Each one was chosen because it helps to interpret the text. Although a good atlas will constitute a valuable aid in the study of the text, it is not essential. Practically all places mentioned in the text are shown on the maps. Foreign equivalents of many names of places are given in the text in parentheses following the accepted American spellings. These also are shown on the maps.

The authors wish to acknowledge their indebtedness to the many geographers and other scientists who have paved the way for this text by their research. Special acknowledgment is given to Mrs. Earl

PREFACE

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DANIEL R. BERGSMARK

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Part I

THE NATURAL ENVIRONMENT
AND MAN



Maps of this type often have surprises about transoceanic distances and direct lines connecting familiar points. For example, the shortest and most direct air route between Chicago and Malaya would extend northward across Canada, the Arctic Ocean, and the continental mainland of Asia. We are told that no spot on earth is more than 60 hours from our local airport and that the 3,460 miles from New York to London can be covered in a 17-hour flight. This air age has come upon us with striking suddenness. We have become aware of the fact that wars can be won by the aid of the new air-age geography. Moreover, the peace that we win must be built on a clear understanding of global geography.

POPULATION DENSITY AND ENVIRONMENT

The natural scene and the world's population. Imagine that you are making an airplane trip around the world. As you look down upon the earth's surface you see evidences of the works of man. You also see an ever changing natural scene or landscape. This scene varies from place to place because of the inequalities or differences in climate, land surface, and natural resources. Similarly, man's activities show striking contrasts from place to place. Moreover, the natural scene is modified by human activities. Where people are found in great numbers the natural scene is changed considerably; for as man uses the resources about him, he usually leaves evidence of his presence, or a mark that is more or less permanent in the landscape. The cultural landscape shows the works of man, such as buildings, roads, railroads, canals, bridges, cultivated fields, and manufacturing plants.

The landscape, therefore, gives us a good clue to the density of population and the occupations of man. Where the cultural landscape is that of a city, with its manufacturing plants and avenues of commerce, the population tends to be crowded together—that is, the population density is great. On the other hand, where the landscape shows only scattered ranches or farms, the population tends to be sparse. (See illustration opposite.) However, even an agricultural area may be densely populated, and the evidences are found in the fertile, well-watered valleys of India, China, Japan, Java, and Egypt, where the small fields, the great numbers of closely spaced villages, and the numerous paths and roads indicate the great population densities.

Basic factors affecting the distribution of population. Three classes of geographic factors affect the distribution of population and the nature of human occupations. The factors of the first class are climate, location, and relief (unevenness of earth's surface)—factors that are persistent and universal. They are present at all times and in every part of the world and, as we shall see later, influence man's activities in many ways, whether he wills it or not.

These factors are not resources that man can use directly, yet they have an important bearing upon the ways in which, or the extent to which, his resources are used.

The primary geographic factors of the second class are the natural resources, such as soils, minerals, waters, native plants, and native animals. Unlike the factors of the first class, these are neither universal nor persistent. Some parts of the world are lacking in plants, other areas have no native animals. There are rocky areas devoid of soil and barren desert wastes lacking in water. Moreover, where natural resources exist, they remain without value until called into use by man. Thus North China contains large reserves of high-grade coal which are not being mined at the present time. Central Africa contains large waterfalls which are of no value now, but which some day may be used in developing electric power. In still other areas, soil, animal, and plant resources remain practically untouched. When utilized, these natural resources provide the basis for occupations of various kinds, and consequently have a very direct bearing upon population distribution.

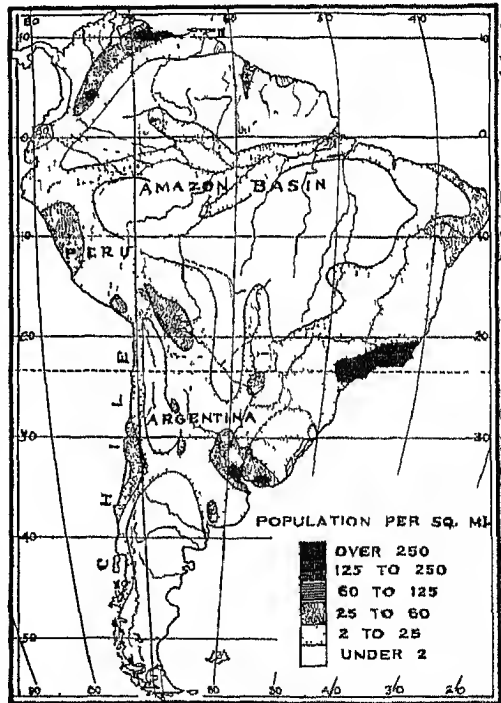
The third class is represented by man and his works. As already indicated, man is one of the most important geographic factors in the geographic environment. He is constantly modifying his natural environment by building roads, digging canals and tunnels, irrigating land, discovering methods of using products that have never been of value before, inventing new and better equipment, and in many other ways making possible new and better uses of his natural resources. Such developments affect man's occupations and population distribution.

Climate is a dominant factor in relation to population density. No other single factor plays such an important part in determining the population density of various parts of the world as does climate. The scarcity of water in the great Sahara Desert is sufficient in itself to prevent any large population from being supported within the region. In fact, more than one-fifth of the land mass of the world is so dry that it can never support more than a few people to the square mile of land. The cold climate of Antarctica is reason enough to prevent man from making this land his home. Other large areas are also cursed with frigid climates. Thus, altogether, approximately one-fifth of the world is too cold or the summers are too short to support more than a few people per square mile.

A combination of factors determines population density. In some

parts of the world a single geographic factor may be sufficient in itself to result in a sparse population. Thus the lack of a suitable water supply in the great Sahara Desert is sufficient in itself to prevent any very large population from being supported within the region. The cold climate of the south polar continent is reason enough for its being entirely without population. The rare atmosphere and cold climates of the higher portions of the Andean Highlands and the Tibetan Plateau are sufficient in themselves to make for a sparse population. In most parts of the world, however, a combination of factors determines the density of population.

Note the large area within the Amazon Basin which contains less than two persons per square mile. At first one might be inclined to attribute this sparse population to the hot, moist, unhealthful climate of this large Brazilian lowland. Such, however, is not the case. This fact may be proved by noting the exceedingly dense population of the lowlands of Java. The lowlands of this little island support approximately 1,000 persons to the square mile, and contain a population density that is several hundred times as great as that of the Amazon Basin. Yet both areas contain climates that are almost identical. Therefore, the sparse population of the Amazon Valley cannot be wholly the result of the hot, wet, unhealthful climate any more than the dense population of Java can be attributed to these climatic characteristics.

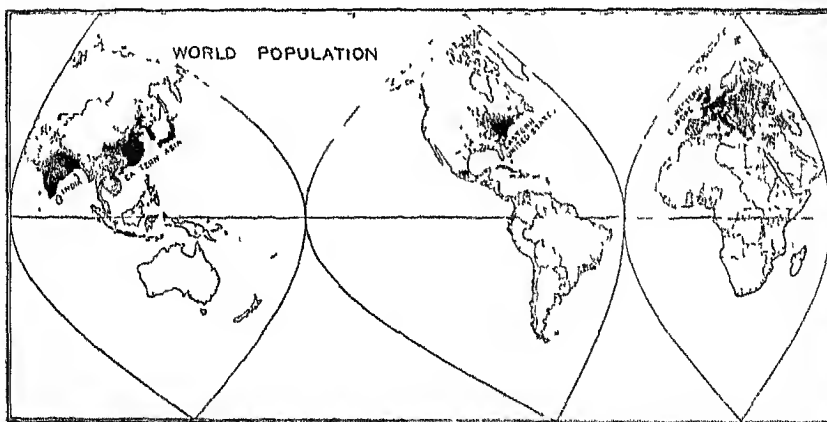


Population distribution of South America. Note the comparatively few regions of density, such as in and near the coffee-producing region of Brazil, near the estuary of the Rio de la Plata, in northern Venezuela, and on the Bogota Plateau of Colombia. Note also the sparse population in the Amazon Valley and in Patagonia.

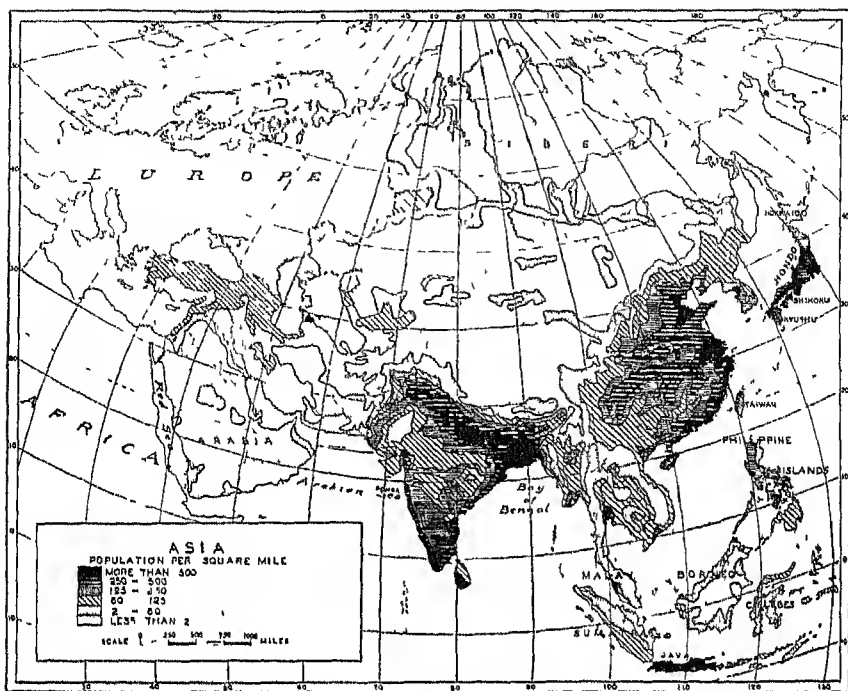
Further study of these two areas indicates that Java, while having the same climate as that found in the Amazon Valley, has special advantages for the support of a dense population which the Brazilian area does not have. Java has fertile soils, whereas most of the soils of the Amazon Valley are exceedingly infertile. Java lies close to the teeming millions of southeastern Asia and has received many immigrants; Brazil is not receiving large numbers of people from densely populated neighboring areas. Java has been aided by the capable Dutch planter, Brazil has received little such aid. While this is not the complete story it is sufficient to indicate that many geographic factors may enter in to determine the density of population of any region.

DISTRIBUTION OF THE WORLD'S POPULATION

The four major population areas. The population map of the world shows at a glance the concentration of most of humanity into four major areas (Map below.) These are eastern Asia, India, western Europe, and eastern United States. The large population groups of eastern Asia and India are located within the regions of monsoons, where heavy summer rainfall makes possible an abundant supply of food. In the tropical parts of these lands, the high temperatures of winter enable the production of still greater quantities of food,



Dot distribution map of the world's population. Note the four major areas of humanity—eastern United States, western Europe, eastern Asia, and India. Each dot represents 500,000 people.

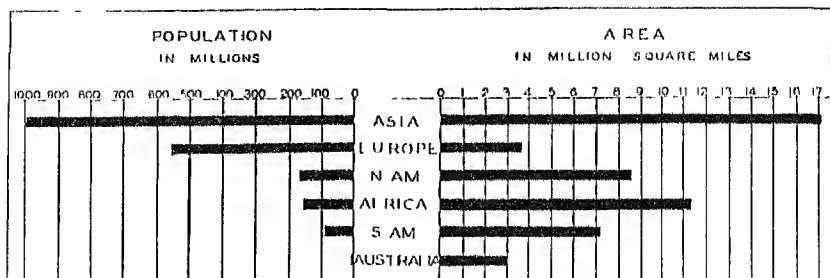


Population per square mile in various parts of Asia. Note the densely populated regions in India, China, and Japan. Note also the way Java stands out as the most densely populated part of the East Indies.

especially where water may be obtained for purposes of irrigation. Here the growing season lasts most or all of the year, and crop production may be carried on continuously, or almost so.

Western Europe and eastern United States are areas of abundant energy and abundant resources. Their climate appears to favor human energy, as we will see in Chapter 2, and the large reserves of coal and water power are used in these regions to supply an abundance of mechanical energy. In addition, these regions are favored with a variety and abundance of other natural resources which are necessary for the development of industry and commerce. Eastern United States and western Europe have, therefore, become the chief industrial and commercial parts of the world.

A comparison of the continents. According to the latest available statistics, it is found that the world has more than 2,000,000,000 people. Just think of it for a moment—2,000,000,000 people! One-



Population and size of the continents

half of all these people live on the largest of the continents, Asia (Map, page 7) Next in order of rank are Europe, North America, Africa, South America, and Australia. A glance at the graph will show you that North America ranks third in size and in population (Graph above.) Europe, on the other hand, is fifth in size of the major land masses, and ranks second in population. Thus, the average population per square mile, known as density of population, in Europe is very great. In fact, Europe, with 141 people per square mile of land, outranks all other continents in population density.

Densely populated areas. In no continent is the density of population uniform. There are areas in which people are concentrated. These areas contrast sharply with vast sparsely populated regions which are found on all the continents. Even within the great population centers of eastern Asia, India, western Europe, and eastern United States, the people are not evenly distributed. Thus in eastern Asia, the lowlands of Japan and of China show a striking concentration of people. Here hundreds of millions are massed into the productive coastal plains and river plains of this continent. In these lowlands the soil tends to be deep and fertile, slope wash is at a minimum, climate is suited to abundant crop production, and transportation is made easy.

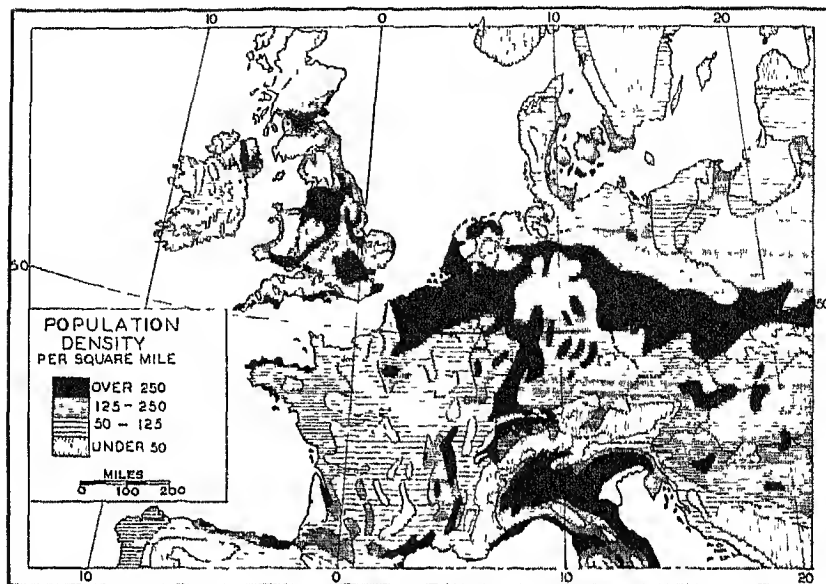
Densely populated areas in China The large river plains of China are listed among the most densely populated regions of the world. (Map, page 7.) In China the vast river lowlands of the Hwang Ho and the Yangtze have on the average more than 640 people to the square mile, or about one person for each acre. Here more than three-fourths of the inhabitants are farmers and the average farm family must make its living from only three and one-half acres of crop land. Since Chinese families are large, each person

gets but a small share of the agricultural output. Although the Chinese use their land intensively and get high yields per acre, the population is so large that very little can be stored or saved for future need. What then is the result of drought or floods, which often occur in these lands? There can be but one answer, and that is widespread famine resulting in a great loss of life.

Let us suppose that the Chinese should raise their standard of living within a short period of time, that is, that they should increase their wants and desires, and demand a great many of the luxuries as well as articles of convenience and necessity consumed by the average American family. How could this be accomplished? Could China's land and resources then care for her millions of people, with standards of living comparable to those of the United States? It is the opinion of most of the authorities on this subject that China could not take care of its present population if the standard of life were increased to any great extent. From this point of view, China is definitely overpopulated as viewed by the standards of the Western world. But at present China's land must be cultivated intensively in order to supply the necessary food. Little time is left for the making of luxuries.

Densely populated areas in North America and Europe. Western Europe and eastern United States are other areas of teeming millions. But unlike the densely populated agricultural regions of China and India, the people of the Occident are occupied mainly in industry and commerce. In that part of western Europe where industry and commerce have reached the highest plane of development, various areas have more than 600 people to the square mile. (Map, page 10.) Together, Belgium and the Netherlands have an average of 687 people to the square mile of land. On the basis of their own land and resources, however, these countries are not able to support such large populations, as we shall see presently in this chapter. They depend in part upon foreign resources, that is, upon resources obtained from their colonies and by commercial expansion.

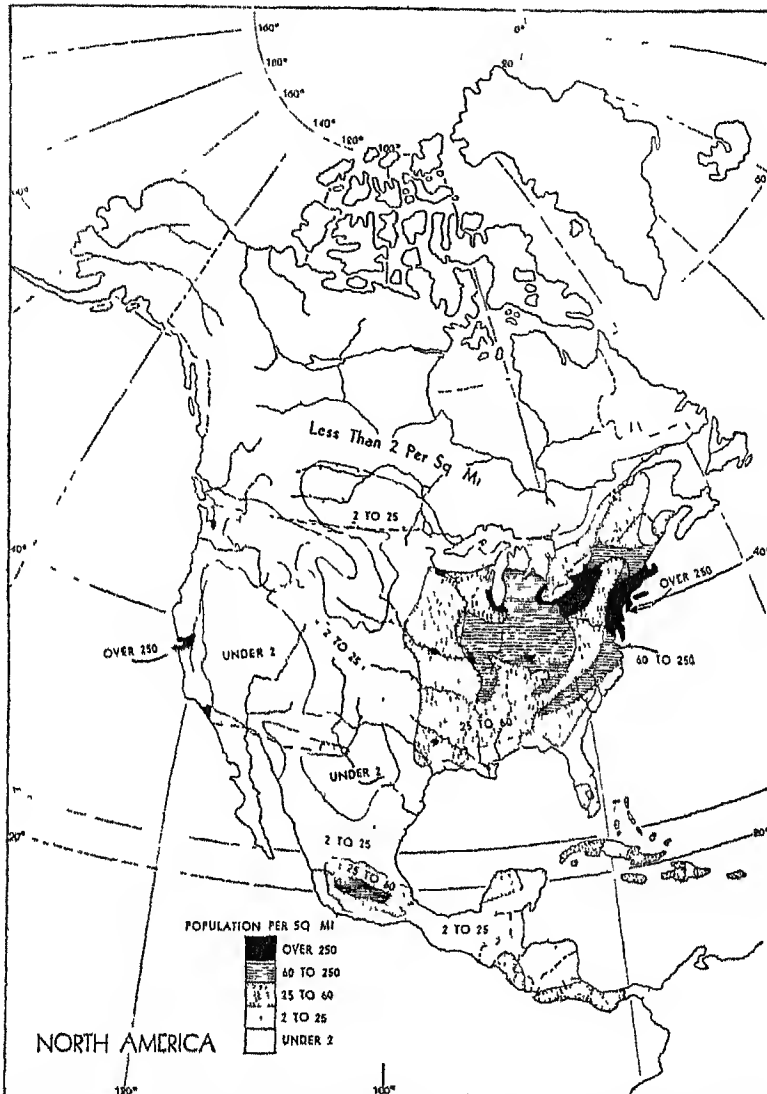
In North America the most densely populated areas are found in eastern United States. (Map, page 11.) New Jersey and Massachusetts have more than 500 people per square mile, and in Rhode Island the density exceeds 600 per square mile of land. This eastern part of our country has a favorable location for trade and industrial development. There foods and raw materials are drawn from



Population density in western and central Europe. Note the great densities in the industrial areas, and in regions in which agriculture is very intensive in character (Averages according to J. Paul Goode.)

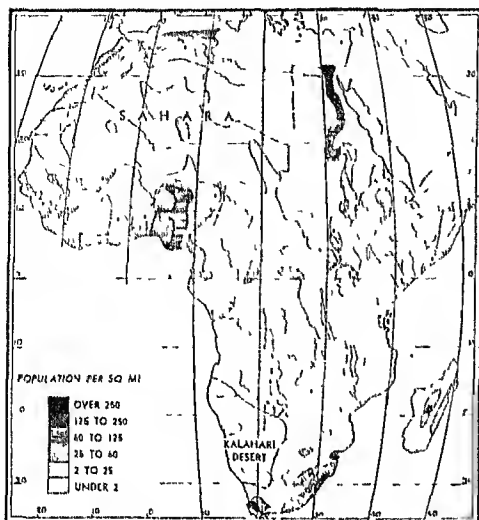
other parts of the United States and from foreign lands. The eastern states of our country are favorably located with regard to our large coal reserve in the Appalachian area. Moreover, the agricultural lands of Massachusetts, Rhode Island, and New Jersey are used more intensively than are the lands of sparsely populated states, such as North Dakota, Montana, Wyoming, and Kansas, located in the interior of our country.

Within this eastern section of the United States are located large cities, such as New York, Philadelphia, Boston, and Baltimore. The greatest concentration of people on the entire continent is found about the mouth of the Hudson River. Here, within a radius of 15 miles of the City Hall of New York, one will find almost 10,000,000 people. This area has proved to be a very suitable place in which to gain a living by finding employment in various occupations, chiefly manufacturing, commerce, and services. The location of New York with respect to major lines of transportation has greatly aided the development of her occupations. This great center of commerce occupies a favorable position for assembling raw materials and for distributing economic goods.



The density of population in various parts of North America (Averages according to J. Paul Goode)

Sparsely populated areas. In contrast to these veritable hives of industry and commerce are the sparsely populated lands of the world. In northern North America, northern Europe, and northern Asia vast stretches of land contain, on the average, less than two



Population per square mile in various parts of Africa. Note that the densely populated areas are located mainly near and along the coasts, such as in the coastal region of Algeria, Tunis, Morocco, in the Gold Coast Region, Nigeria, and the coastal regions of southern Africa. Note also the great concentration of people in the Middle and Lower Nile Valley.

people per square mile. In these northern areas the cold climate sets physical limits to food production. In the tropics one finds other large regions of sparsely peopled land. Here some areas are too humid and hot for favorable human use, while others are too hot and dry to be suitable as a home for man. The Congo Basin of Africa and the Amazon Basin of South America are among the humid, hot lands; whereas the Sahara is one of those vast, hot, dry lands of the earth. (Map at left.) It appears that the unfavorable climate is the single most important geographical

factor limiting the development of industry, commerce, and culture in these regions.

The dry lands of the world are not confined to the tropics. Even the temperate zone contains extensive arid regions. Thus a large portion of western United States is a sparsely populated, arid region. (Map, page 11.) Most of the interior of Asia falls into this classification. A glance at the population map of Asia shows the striking contrast in population density between this arid interior and the humid southern and eastern divisions of the continent.

Some parts of the world are sparsely populated chiefly because of unfavorable relief. This is clearly shown on the population map of North America, where the Rocky Mountains and Sierra Nevada-Cascades contain but few people per square mile. In rugged highlands economic development is retarded, owing to the small areas of level land suitable for agriculture. Natural resources, such as forests and minerals, are often difficult of access because of the unfavorable transportation in rugged mountains and plateaus.

Advantages of a large population. Mere size of population often contributes to a country's well-being. Large numbers make for economic and political strength unless the population is so large that it causes too great a drain on land and resources. But up to the point where added numbers cause lower per capita production and consumption, the population may safely increase without any detrimental effects. Politically, a large population favors national security. There is considerably more man power in the event of war and less real need for a large army. However, it should not be overlooked that the need for a large army will also be governed by other factors, such as the length of a country's boundaries, the position of a country, and the strength and character of its neighbors. Economically, a large population constitutes a large home market. Since most goods are manufactured more cheaply in large than in small quantities, production is favored in the large market areas. This fact, however, applies with less force to the large markets of India and China, where most of the people are poor and unable to buy many of the more elaborate factory products, such as automobiles, radios, labor-saving machines, electrical household appliances, and many others. A greater saving is realized in the large-scale manufacture of these elaborate factory articles than in the production of the bare necessities consumed by the masses of the Orient.

Density of population and material well-being. The well-being of a nation is to a marked degree affected by the distribution of its population. Complete and efficient use of land and resources calls for a population density that is neither too large nor too small. Overcrowding is quite as unfavorable as undue sparseness of population density. It is a fortunate circumstance for the United States that the population is neither too large nor too small, but occupies a middle position as to density. A phenomenal increase in population would in all probability mean lower standards of life, and our people accustomed to a high living standard would resist the lowering of it.

POPULATION AND OCCUPATIONS

Major occupations. A study of the development of civilization shows how mankind has been engaged first mainly in one occupation, then in another. Just as primitive people now seek a living chiefly by means of hunting, trapping, fishing, and gathering of

products, so primitive man during past periods was engaged in these activities. It is by means of our occupations that we gain a living. These occupations consist of basic or extractive industries, the manufacturing industry, trade, transportation, and services. The basic industries include agriculture, grazing, forest industries, mining, quarrying, hunting, and fishing. These are basic and extractive industries, since they involve in each case the use of some natural resources. Thus in agriculture use is made of the soil, whereas in grazing and in the forest industries the natural vegetation is utilized. Mining and quarrying draw upon the mineral resources, fishing uses the native animal life of the waters, while hunting is concerned with the exploitation of the animal life of the land.

Agriculture as a major occupation. More people gain a living by means of agriculture than by any other occupation. About three-fourths of the population of Asia, or some 750,000,000 people, depend directly upon agriculture. In Africa and South America, also, agriculture is the chief source of wealth and the most important of the occupations. Even in parts of Europe, a continent which is considered highly industrialized, the agricultural industry leads all others, especially in southeastern and eastern Europe; in Russia more than 70 per cent of the population is classified as rural.

Although grazing often takes place in areas which also produce crops, there are large regions of the world in which grazing is the dominant activity. Yet there are more people engaged in crop production than in pastoral pursuits. Areas in which grazing assumes a relatively important part in the economic life are Australia, the llanos of Venezuela, Patagonia, the savannas of Africa, southern Africa, the great plains of the United States, Mongolia, and semiarid Russia.

Agriculture predominates in densely populated Oriental lands. Agricultural workers make up the great bulk of the population of the densely peopled nations of the Orient. With their present inefficient methods of agriculture, these people have but little labor to spare for other occupations. (Illus. opposite.) Great numbers are required to produce food. Their crop returns per capita are very low, and they are therefore unable to pay for many of the economic goods as well as services enjoyed by the masses in the United States. Moreover, agriculture is held in high esteem in the Orient, whereas certain other occupations, such as commerce and mining, occupy lower ranks in the social scale.



Scene in Japan showing a primitive method of threshing grain. Many people are required to produce food where primitive agricultural methods are used (Courtesy Society for Visual Education.)

Relative decline of agricultural population in the United States. The proportion of the total population occupied as agricultural workers has declined from decade to decade. Each American census has shown a smaller percentage of people engaged in agriculture. Thus in 1850 more than three-fourths of all workers (gainfully employed) were on the farms, in contrast to less than one-fourth at the present time. This declining percentage of our agricultural population has been due largely to the growing efficiency of the farms of the United States, mainly because of the increasing use of labor-saving machinery and equipment. The increasing efficiency on the farms has made it possible to satisfy the requirements of the entire population of our country for food products by the employment of a smaller proportion of our people as farmers. Thus large numbers are set free to engage in other occupations, such as manufacturing, distribution of goods, and services. Today a large number of the workers in America are available to provide for human wants that are considered less necessary than the basic agricultural foodstuffs.

Other basic industries. Only a small part of the world's population finds employment in the other basic industries—hunting, fishing, quarrying, mining, and lumbering. In some of the sparsely populated countries, however, these occupations are relatively important. For example, in Newfoundland more people are engaged in fishing than

in any other economic activity. As a major occupation along the west coast of Norway the fishing industry increases in relative importance with distance from south to north; but for the country as a whole the chief occupation is agriculture. In the sparsely populated tundra and arctic regions most of the people gain a living chiefly by finding employment in fishing and hunting. In Japan more people are engaged in fishing than is commonly known. Although most of the people of Japan gain a living by means of agriculture, manufacturing, and commerce, there are more than 1,500,000 Japanese fishermen.

Manufacturing as a major occupation. For the world as a whole, the manufacturing industry is surpassed only by agriculture in the total number of people who find employment in it. The manufacturing industry uses the products of the basic industries, such as raw materials of the farm, the forest, the mine, and the waters. These products are made into a form which satisfies human wants. In other words, they are made useful to mankind. For example, logs are converted into lumber, pulpwood, and paper; copper is drawn into wire and prepared for carrying an electric current, cotton is woven into clothing; and food products are manufactured from domestic animals, wild animals, fish, and from the crops of the land. All this is manufacturing or processing of raw materials. Of the industrialized areas of the world, the most highly developed are western Europe and eastern United States. These regions draw upon the products of the basic industries and therefore obtain raw materials from all parts of the world. Many of the largest industries of western Europe and eastern United States have been attracted to the coal fields of these regions. As industry is developed it attracts workers and tends to increase the density of population. Hence we find the most densely populated districts of Europe and North America in the most highly industrialized parts of these continents. In succeeding chapters the various kinds of manufacturing industries will be studied.

Trade and transportation. Trade is the exchange of goods and services for other goods and services. When this exchange takes place within a certain country it is called domestic trade; whereas exchange of goods and services of one country for those of another is foreign trade. Trade is therefore a necessary and important occupation in the commercial world. In the United States about 6,500,000 people gain a living by finding employment in some form of trade.

By means of transportation the services and goods of the various

regions are made available. Transportation may therefore be considered the bridge whereby the various regions and people of the world are connected. Roads, railroads, ocean routes, canals, river routes, bridges, steamships, trains, and automobiles all are part of this great system of transportation. In some countries human beings are the chief carriers of goods from one area to another. In China human carriers are still the chief method used in transporting products; great numbers of people have to be employed in this occupation. This Chinese transportation, however, is expensive and unsatisfactory.

People engaged in transportation and communication in the United States. The ability of the people of the United States to afford an abundance of many different kinds of services is an indication of their high standards of living. Of these diverse services transportation and communication are of vast importance in the economic life of our country. This is a land of great distances and complex business transactions. The various types of transportation and communication therefore perform an immense task. The steamship, the railway, the motor car, the airplane, the telephone, the mail, wireless, and radio all play a prominent role. A vast army of workers is therefore necessary to satisfy our demands for transportation and communication services, and the number is steadily increasing.

Services. Last but by no means least is that great army of workers engaged in serving humanity. Services are of various kinds, such as domestic and personal services, professional services, and public services. Doctors, lawyers, professors, teachers, musicians, public officials, nurses are all included within this occupation. These people serve those who work in all of the other occupations. In the United States more than 4,500,000 people are actively engaged in domestic and personal service, while more than 3,000,000 are employed in the professions.

The fact that more than 3,000,000 workers in the United States can be spared from the production and distribution of goods to engage in professional services is one of the results of the efficiency of American industry. In general the professional workers help satisfy the highest of human wants or those which are farthest removed from the bare necessities of life. As people have advanced in standards of living they have demanded that more be done for the human body and the human mind.

Occupations and the natural environment. In this chapter,

have studied some of the more important facts in regard to the distribution of the peoples of the world, the areas of dense and sparse population, and the major occupations. That natural environment is related to occupations is a well-known fact. For example, climate in one way or another affects the members of all occupations, and is the subject-matter of Chapter 2. Natural environment also plays a prominent role in the use of the land. "How People Use the Land" is presented in the third chapter. Finally, the large-scale production and widespread use of minerals are vital to our modern civilization. Back of the power that binds together the various parts of the commercial world are the minerals. Through the Stone, Bronze, and Iron Ages, and up to the present time increasing numbers of people have been engaged in making mineral products. Thus Chapter 4 is devoted to a discussion of the importance of these basic raw materials.

QUESTIONS AND EXERCISES

1. Find the population density (in round numbers) of the following seven Great Powers--the United States, the United Kingdom, Germany, France, Italy, Japan, and the Union of Soviet Socialist Republics. Consult the Reference Tables, page 731, for statistics.
2. If the world's total population of about 2,000,000,000 people could be crowded into the United States, what would be the population density of our country? How would it compare with the population density of Java, Belgium, and the Netherlands?
3. What are the advantages of a large population? Could the population of a nation become too large?
4. Study the population map of North America. (Illus., p. 11.) Give reasons for the sparsely populated areas of western United States and the densely populated areas of eastern United States. Why is northern Canada sparsely populated? What is the most densely populated part of Mexico?
5. Study the population map of Asia. (Illus., p. 7.) Suggest reasons for the sparse population in the central and northern parts of that continent.
6. Show why it is necessary to take into account more than single factors of the environment in order to explain the density of population in certain areas.
7. Why is such a large proportion of the working population of the Orient engaged in agriculture? Give reasons.
8. From time to time people have expressed fear concerning a possible food shortage because of the movement of farm families to the cities.

How has it been possible for the United States to remain largely self-sufficient in food supplies while the percentage of agricultural workers has declined?

- 9 Name four countries in which more than 35 per cent of all workers are engaged in manufactures and handicrafts. Where are these countries located? Get statistics from Reference Tables, page 731
10. In India only 16 per cent of the working population is engaged in the professions, while in the United States about 67 per cent of all workers are engaged in such occupations. Suggest reasons for the much larger percentage in the United States as compared with India

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THE HUMAN SIGNIFICANCE OF
CLIMATE AND WEATHER

Climatic influences are universal and persistent. Weather and climate are always with us. Weather represents the atmospheric condition (temperature, humidity, precipitation, sunshine, and so forth) at a given time, climate is represented by weather conditions over a long period of time. These elements of the environment affect the lives of each human being every day he lives. Man is not only affected by local weather but by climates and weather conditions in distant lands. Drought in the Great Plains may mean high-priced bread in Ohio, New York, and England. Frost in Florida or California may result in a scarcity of oranges in the rest of the country. And in a countless number of other ways the climates and weather conditions throughout the world affect our everyday lives. None of the other geographic factors influence human activities and behavior in so many and such vital ways.

Climates and population distribution. Climate is the most important single factor in determining the distribution of population. Almost one-half of the land surface of the earth is too wet, too dry, or too cold to support more than a few people to the square mile. Adverse climate excludes approximately three-fourths of the land of the world from profitable cultivation.

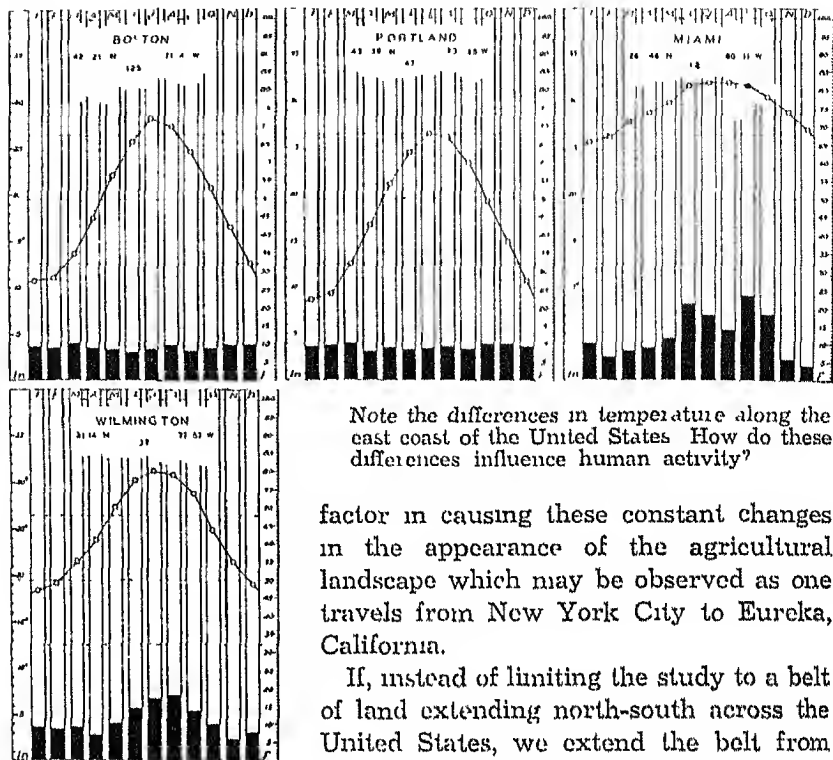
Climates and weather as related to human occupations. Climate and weather cannot be said to determine the things man does. They do, however, set broad limits to the possible range of human activities in any given region. Man cannot grow oranges profitably in the open plains of North Dakota; he cannot build snow houses in the Amazon Valley, nor grow cotton profitably in the British Isles. Certain occupations—for example, mining—may seem on first thought to be independent of climate and weather. Such, however, is not the case. Climatic conditions must be given serious consideration in the task of mining ore in the frozen tundra of Arctic Sweden, nitrate in the sun-parched Atacama Desert of northern Chile, or platinum in the hot steaming jungles of tropical Colombia. The coal miner finds his work more or less seasonal as a result of the unequal demand for fuel in summer and winter. Everywhere the zest with which the

miners work is closely related to the climates of the various regions within which the mines are located

These examples of the relation of occupation to climate and weather are only a few of the many which could be given. In fact, the great diversity of climates and the changableness of weather are the most important factors in making human occupations so tremendously rich in variety from one region to another, and in determining the degree of energy with which the people of any given region work.

Climate and variety of occupations If one studies the coastal belt of eastern United States, he finds that industries differ markedly from one section to another with differences in climates. A constant succession of occupations may be noted along the entire route from southern Florida to northern Maine. In southern Florida emphasis is given to winter sports and winter-grown fruits and vegetables. In northern Maine, man's major economic interests are associated with summer sports, lumbering, and the production of such crops as will mature during a relatively short growing season. The long stretch of coast between these two areas is given to a great variety of occupations. In central and northern Florida the dominant agricultural activity is the growing of oranges, in Georgia and South Carolina cotton is king; in North Carolina tobacco is a major crop, in New Jersey the most important money crops are summer-grown vegetables; while in Massachusetts the coastal belt is famed for its production of cranberries. These changes are associated with several geographic factors, such as soils, location with respect to markets, and differences in human interests. Nevertheless, the constant succession of climatic types is the major factor in bringing about the equally striking succession of human activities.

Even more striking variations in climates and resulting human activities may be observed in crossing the United States along an east-west route. While thousands of men are shoveling snow in the cold, raw winter winds of New York City, other thousands are playing in the pleasant sunshine of California. The major harvest season of New York State is summer and fall, while most of the crops of California are harvested during the winter and spring. Between these states emphasis is given in one region or another to such diversified uses of the land as market gardening, dairying, lumbering, corn production, pastoral activities, and irrigation agriculture. Differences in market facilities, topography, and soil fertility are all factors in making for this richness in variety of human activities. However, climatic variation from one region to another is the most important



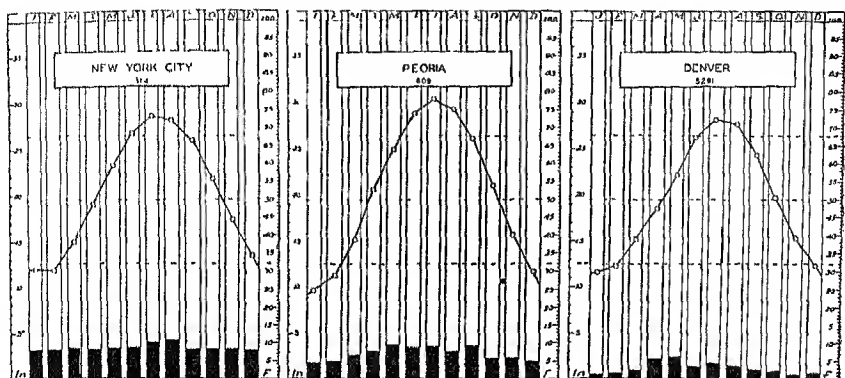
Note the differences in temperature along the east coast of the United States. How do these differences influence human activity?

factor in causing these constant changes in the appearance of the agricultural landscape which may be observed as one travels from New York City to Eureka, California.

If, instead of limiting the study to a belt of land extending north-south across the United States, we extend the belt from the hot steaming jungle of the equatorial

lowlands to the frozen tundra of high latitudes, we find a much greater variety of human activities as related to climates. In a similar manner an east-west belt that extends around the world reveals an almost equally rich variety of occupations as related to weather and climates.

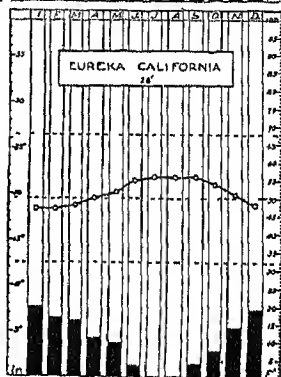
These variations of occupation as related to climates and weather are not wholly limited to the uses of the soil—agricultural, pastoral, and forest industries. They are also related in a less striking manner to other industries, such as manufacture and mining. Most of the world's manufacturing plants are located within the temperate zones, where the climates are invigorating, and where man feels energetic and ambitious; few are located within the tropics, where both human energy and ambition are usually at a low ebb. The manufacturing centers require minerals which in many cases can be mined near by. In other cases the manufacturer may be compelled to obtain these minerals in distant parts of the world and in some cases under very unfavorable climatic conditions.



Note the differences in temperature and rainfall along the fortieth parallel across the United States. How do these differences influence human activities and well-being?

Climate, race, and occupation. In some parts of the world European peoples find it difficult to do manual labor because of adverse climatic conditions. For example, the tin mines of Bolivia are situated on high mountain slopes where the air is so rare that Europeans, unaccustomed to the high altitudes, can do but little physical work. The native Indians, who, through long occupation of the region, have become somewhat adapted to the rare air, are employed to do the mining. Even the Indians are required to work slowly and need long and frequent periods of rest. Similarly the white man finds that he is unsuited to work in the platinum mines of Colombia. Here, however, the difficulty is based on the hot, wet, unwholesome climate rather than on the rare atmosphere. Both the Negro and the Indian seem to be better fitted than the white man to work in the unhealthy tropical jungle. Consequently, Europeans merely act as supervisors, leaving the heavier labor to the Indians and the Negroes.

Weather and occupation. The common expression "Make hay while the sun shines" is indicative of the influence of the weather on occupation. On the farm the type of work changes frequently with the weather. This fact is of such common knowledge that it needs no discussion. In the factory and the mine the type of work seldom changes with the weather, but the efficiency of the laborer does change. Dr. Ellsworth Huntington, who has given many years



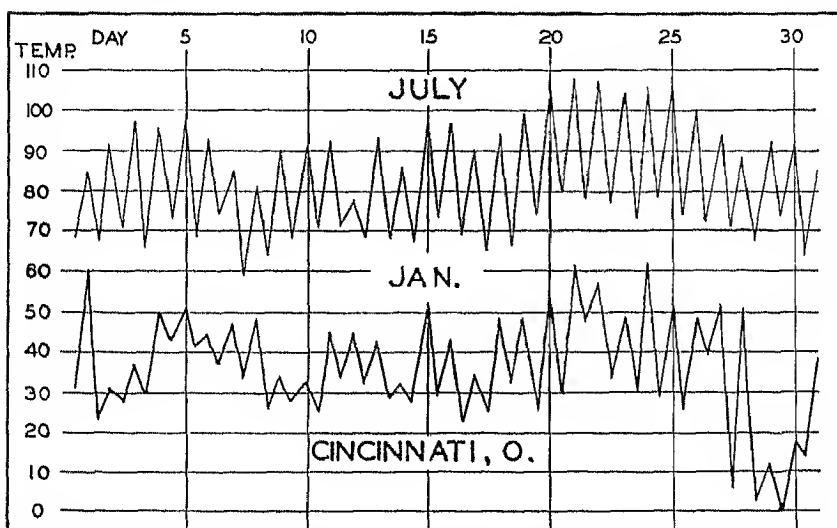
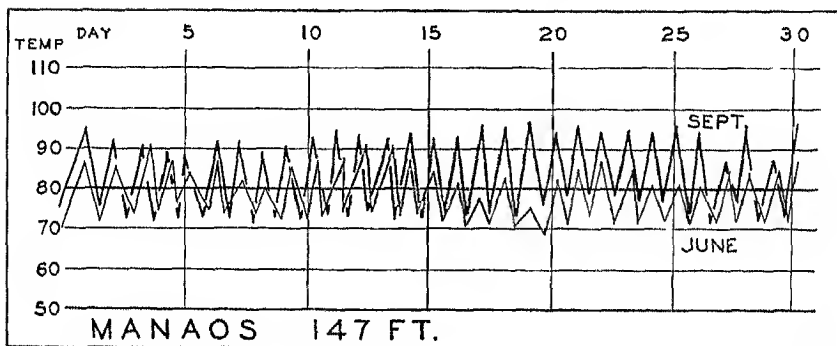
of serious study to the influence of climate on man, has shown that weather conditions from day to day exert great influences on the speed and accuracy with which the bank teller, sales girl, factory employee, and other laborers work.

Countless other examples might be given to show how climate and weather affect man, both in his choice of occupation and in the degree of accuracy and energy with which he pursues it. What a monotonous place this planet would be if the climate and weather conditions were the same for all parts of the world!

World climates and home life. Has it ever occurred to you how fully you make use of the great variety of world climates each day? When you arise in the morning you wash with soap which contains coconut oil brought from the hot, moist coastal areas of the East Indies or the Philippine Islands, or the soap may contain palm oil obtained from the hot, wet lands of West Africa, fats of animals that have been reared in the Great Plains or in the Corn Belt, and to a lesser extent a half dozen other ingredients which are the products of as many types of climates. The comb with which you dress your hair is made from rubber gathered from the rain-drenched hills of Malaya, or from the hoofs and horns of cattle reared in the semiarid lands of Patagonia. You wear hose made of silk produced in subtropical Japan, or perhaps of rayon made from pulpwood grown in the great Canadian forest. The cotton and wool in your clothing were produced in other types of climate, your shoes and fur coat in still others. Your breakfast of bananas, oranges, coffee, cream, sugar, and bacon required the products of several different types of climate. The automobile in which you ride to school may contain wooden parts, a leather top, cloth upholstery, and it is painted the color of your choice. To provide such automobiles the manufacturer must gather animal and vegetable products from widely separated areas having a great variety of climates. Thus, before the day's work is far advanced the average American high school boy or girl uses products assembled from practically every climatic region of the world.

THE RELATION OF CLIMATE AND WEATHER TO HEALTH AND ENERGY

Man's health and energy are more dependent upon climate and weather than upon any other geographic factor. In the hot, wet lowlands of the equatorial regions, most of the people feel tired most of



Note the monotony of the temperatures during the hottest and coldest months at Manaos, Brazil, compared with the changeable weather at Cincinnati, Ohio. During the year charted, the extreme temperature variation at Cincinnati exceeded 108° , whereas that of Manaos varied but 28° .

the time This tired feeling is the result of the monotony of weather conditions from season to season and from one day to another. (Graph above) Millions of such people consider the opportunity to rest one of the greatest luxuries of life. On the other hand, in places like Boston, Chicago, and Cincinnati, with their changeable weather, people commonly feel energetic and full of vitality. In such areas physical and mental activity brings joy. The games and sports that are most popular are the ones requiring an abundance of action. These differ-

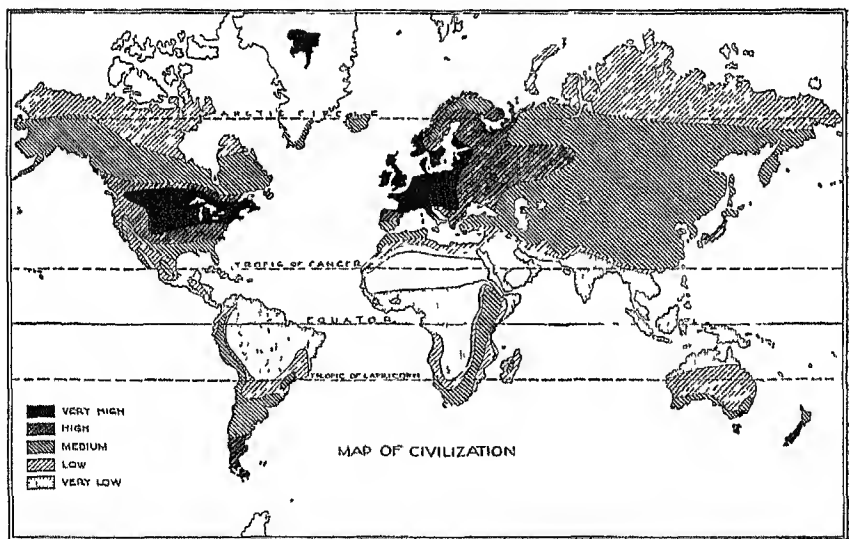
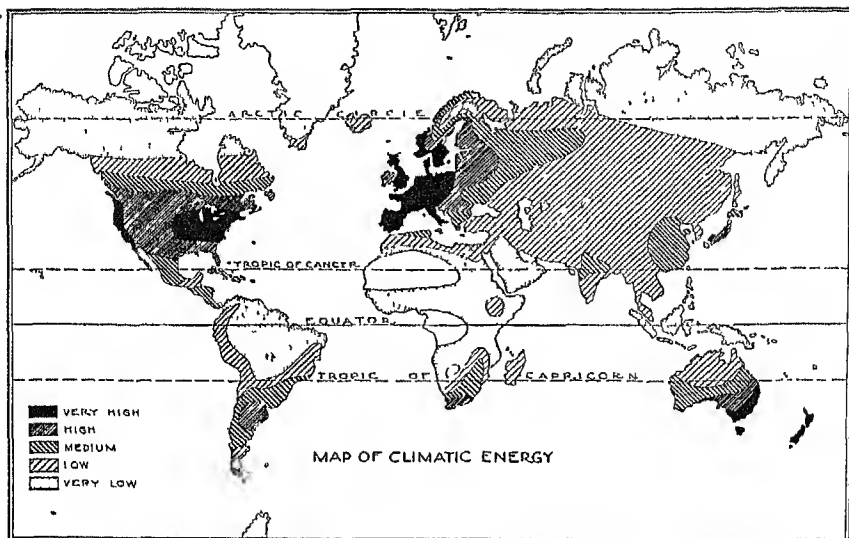
ences in the physical and mental activity of man from one region to another are largely the result of differences in climate.

Dr Huntington's theory concerning climate and human energy (a theory widely accepted as fundamentally sound) is essentially as follows: The best temperatures for physical activity are those ranging between 55° and 70° F, and averaging about 60° F; whereas, the best temperatures for mental activity are represented by average outdoor temperatures of 32° to 50° F, averaging about 40° F. Variations in temperatures from day to day and from season to season also stimulate both physical and mental action. This theory of the climates best suited to human action fits nicely with the facts of present industrial development. Thus it is seen that the regions possessing the most stimulating climates are the ones that have attained the highest industrial developments. Similarly, those regions cursed with the most debilitating climates are the ones in which man has made least progress.

Differences in weather have somewhat the same influence as differences in climate. One need not go to the tropics in order to observe the adverse influence of tropical weather. It is sometimes as hot and humid in much of eastern United States as it is in Manaus, Brazil. During the periods of hot sultry weather in eastern United States man's energy runs down rapidly. Fortunately, such weather conditions seldom last for a protracted period of time. On days when the weather factors of temperatures, humidity, air pressure, and sunshine are favorable, people feel energetic and full of life. Their minds are strong and active, and their hopes rise. Then with an adverse change in the weather comes a similar change in the physical and mental response of the individual. The body is tired, the mind sluggish, and the spirits depressed. Almost every change in weather brings its resultant changes in human responses. The beautiful October day, the gloomy day of December, the April shower, and the hot, humid day of summer is each associated with a different mental and emotional response.

Health in the tropics. The warm, moist climate of many tropical regions is well suited to the spread of disease-producing microscopic organisms. Such disease germs as those which cause yellow fever, malaria, dysentery, plague, and sleeping sickness take a toll of millions of lives every year. Other millions of people are rendered incapable of much work because of sickness.

A few decades ago the most dreaded disease of the tropics was



These maps indicate that the regions having the most stimulating climates are the ones that have attained the highest degree of civilization. Areas having the most debilitating climates are the ones where man has made least progress. (After Huntington and Cushing, *Principles of Human Geography*. Courtesy John Wiley and Sons, publishers)

yellow fever. Its ravages were so deadly that at times it almost wiped out the white population of certain areas within a few months. Thus on the coast of Santo Domingo a French force of 25,000 men was reduced by this disease to 3,000 men in a single year. The failure of the French in their attempt to dig the Panama Canal did not result from any lack of engineering skill but from their inability to cope with tropical diseases. The number of deaths among the laborers was so great that the French finally were compelled to withdraw from the region.

When later the United States took over the task of digging the Panama Canal, every effort was made to improve the sanitation of the region. The Government sent Dr. Gorgas and other specialists in tropical diseases into the fever-ridden Canal Zone to determine the causes of the diseases and to provide for protection against them. These men soon learned that in these hot wet lands man's greatest enemies were the insects and the disease germs which breed in dirt, decay, and standing water. Consequently, before the engineers and many of the laborers who were to dig the canal arrived, the environment was made sanitary. Swamps were drained, oil was spread over pools and even over streams; water for household use was covered to keep out insects; houses were screened; and the cities were made clean. These were preventative measures. Provisions were also made to care for those who, in spite of these precautions, might be taken ill. Hospitals were built and nurses and doctors were brought in to care for the sick and to prevent the spread of diseases. Under such conditions the Panama Canal was completed with but little loss of life. By such methods yellow fever has been practically stamped out of the Western world.

Some of the other diseases, such as malaria and hookworm, are more difficult to control, but the results of these diseases are not so deadly as in the case of yellow fever. In large areas of equatorial West Africa practically all of the children and 80 per cent of the adults have malaria every year. All of the tropical lowlands and large areas of poorly drained land in the temperate zones are troubled by this disease. Quite certainly more than 100,000,000 people have malaria each year, and the annual loss of life from this disease is numbered by the millions.

Many of the tropical diseases, such as malaria, hookworm, and dysentery, are not highly fatal as a result of a single attack. After repeated attacks the health of the individual is gradually undermined, and the body becomes susceptible to other diseases. In

ya, for example, it is estimated that 40 per cent of all deaths are directly or indirectly from malaria. This large death rate is part of the story. In addition, it is not uncommon in many parts of the tropics for more than one-half of the laborers to be sick part of the time. The resultant economic loss alone is tremendous. Andrew Balfour estimated the economic loss to the British Empire as the result of malaria alone, at \$250,000,000 to \$300,000,000 annually. Moreover, so much sickness results in a certain amount of physical and moral degeneration. It causes people to grow older in their time. In fact, in some of the most unhealthy parts of the tropics, very few of the natives live to be more than 35 or 40 years old. Many of them appear to be old by the time they are 25 years of age.

Houses and homes. The human habitation is usually a small one, yet there is no other place so intimately associated with the life of most peoples. Home is the most beloved spot on earth. It is one of the most universal possessions of the human race. Almost everywhere there is a place that he calls "home." It may be a tent, it may be supported by charity, it may be a shack, or merely four posts and tropical vegetation as a roof, but it is "home." The geographer is primarily interested in the representative houses of each country and takes little note of the costly houses that represent the tastes of rich owners. In practically all parts of the world the representative houses have been adjusted to the climatic conditions of various regions in which they are built. These adjustments are made to all of the climatic factors—temperature, rainfall, snowfall, humidity, sunshine, and winds. The more primitive the people, the more closely their houses are adjusted to the immediate vicinity in which they live. The more industrialized a region has become, and the better the transportation facilities are developed, the more the house is influenced by outside conditions. There is no escaping the fact, however, that in home building, adjustments to climatic conditions must everywhere be made.

Houses of the tundra. During the winter months most of the Eskimos live in houses built of logs, peat, or stone. In summer many of them occupy these same houses while others live in tents. The log houses of tundra peoples are confined to those areas where driftwood is found in considerable supply. These log, peat, and stone houses are relatively warm, yet during the cold winter months snow may be piled around them to help keep out the cold. A few Eskimos still use the igloo (snow house) as a home during



Climate influences the building of man's homes. Much different from this snow house of the North is →

the winter months, and many others are compelled to live in igloos occasionally. This transfer of the family from the permanent house to the igloo is oftentimes made necessary by the fact that the Eskimos may be compelled to move in order to find better fishing ground. Sometimes such moves may be forced upon them during the dead of winter. Then the Eskimos build their new and temporary homes of snow and ice. If they move during the summer they live in tents made of skins

Homes of Alaska. In the region around Fairbanks, situated in the interior of Alaska, where the winter temperatures drop at times to 50 or even 60 degrees below zero, the home-builder must make sure that the house can be kept warm. Many of the houses are built with double walls and the space between is filled with sawdust. This sawdust with its many air spaces is a poor conductor of heat, and consequently an excellent protection against the heat of the house escaping through the walls. The low winter temperatures also influence home-building in other ways. Since the ground freezes to depths of 20, 30, or even 40 feet, it is difficult to maintain water mains or to keep sewage systems in operation. Because of the great expense involved in providing for a constant supply of running water, very few of the homes are equipped with plumbing systems. The sale of bathroom equipment in such a region is exceedingly small even in a progressive town such as Fairbanks.



... this tropical home in Brazil. (Photos from American Museum of Natural History and Ford Motor Company.)

Along the west coast of Alaska, bathed by the warm ocean winds, the winter temperatures seldom fall more than a few degrees below freezing. Since the mild climate has resulted in an abundant forest growth, the houses are usually made of logs or wooden frame, and there is no necessity for double walls. Water systems are easily maintained and modern plumbing systems and convenient bathrooms are common.

Homes in Russia In traveling north to south over the vast plains of European Russia one finds that the typical houses of each region change with the climate. In the frozen tundra region of the north, without timber or crops, there are no fixed habitations except huts. The natives spend much of their time in tents made of skins. This makes it easy for them to follow the reindeer in their search for pasture. In the forest region to the south the typical human shelter is a wooden house. Further south in the grasslands the houses are largely made of sod covered with thatch or turf. In the drier area about the northern part of the Caspian Sea the grass roots are not sufficiently plentiful and long to bind the soil into a sod. Here the peasants have found adobe or pressed clay bricks to be the most suitable raw materials for the construction of homes. Farther south on the heavily forested slopes of the Caucasus we find once again that the homes are made of wood.

Climate and houses in Egypt The Egyptian lives in a land that

is hot and dry throughout the year. The entire family of the fellah (farmer) stays out of doors most of the day, and the house is primarily a shelter for the night. The Egyptians do not need shelter like that built by peoples of northern countries where the home is the refuge of the family during long, gloomy winter evenings. The fellah of the Nile Delta possesses no stone and very little wood, but the mud is of a plastic character which can be molded easily into bricks that quickly become dry and hard in the hot dry atmosphere. These make cheap, yet excellent, building material for a desert region.

Ordinarily the home of the fellah is but little more than four mud walls with a hole in one side for a door. The roof presents the most serious house-building problem. Consequently, many houses have no roofs. The fellah lives under the open sky both night and day. In most cases, however, a rather flimsy roof made of poles covered with palm leaves, straw, or sugar cane stalks acts as a shade, and in case of rain sheds off some of the water.

Climate and houses of primitive peoples A study of the houses of primitive peoples usually gives a fair idea of the type of climate in which they are built. In hot, wet lowlands of equatorial regions, many of the homes are built on piling in order that the occupants may escape some of the adverse influences of the wet steaming ground. The houses are usually built from the wood and leaves of the tropical forest. The walls may have much open space to permit as free circulation of the atmosphere as possible. The roof is usually built with greater care than is given to any other part of the house. This emphasis on roof-building is not surprising, since the major function of the house is to give protection against the tropical rains.

In a similar manner the houses of many other primitive peoples are closely adjusted to local climatic conditions. In the tall grasslands of tropical Africa the walls of many of the houses are made of poles. These are interlaced in such a way as to give strength and rigidity to the structure and at the same time to permit the air to flow through the house freely. The roofs are of thatch made of long grass obtained locally.

Some of the huts that are built in the Kalahari Desert are scarcely worthy of being called houses. Many of them are merely the crudest type of protection against the heat of the sun during the day and the chilly winds at night. Nevertheless, perhaps these backward peoples should be praised for building as well as they do rather than condemned for building so poorly. They have poor building materials

with which to work Bricks are not easily made from the sandy soil, grass is scarce and short, and wood is difficult to obtain Many of the houses are fashioned of twigs and tufts of grass Such huts are of necessity small

Many other examples might be given to show the close adjustment of the houses of primitive peoples to local climatic conditions The examples given are sufficient, however, to illustrate the close relationship that usually exists between climate and the type of houses constructed

Houses and climate in industrial countries In a great industrial nation such as the United States, with its excellent transportation systems of rail, water, and good roads, the regional differences in the types of houses are somewhat ironed out Lumber can be transported cheaply and easily to the prairies and arid lands where timber is scarce In like manner other building materials can be shipped to regions that do not possess them. Thus the home may be built from raw materials collected from widely scattered areas In fact, but a small part of the raw material may be produced within the community in which the house is built

Excellent transportation facilities, however, cannot change the need of building houses to suit the climate. Storm windows and doors which are provided for most of the homes during the cold, windy winters of the plains of Minnesota and North Dakota are not needed in the balmy winter weather of the Gulf Coast The spacious porches associated with many homes of our Southland are scarcely needed or desired in the highlands of New England Sod and adobe houses are still numerous in some of the drier parts of the United States Houses in southern Florida are built without any provisions for heating, whereas in the northern part of this great country the heating unit must always be one of the most essential parts of the house. Thus even in an industrial nation like the United States the architects must always give consideration to minor or even major adjustments in the construction of houses, in order to meet the climatic requirements of each region.

Climate and houses of southern California Perhaps in no part of the United States has there been a nicer adjustment of houses to climate than in the southwestern part of California This region is noted for its sunshine, mild winters, hot summers, and light rainfall. As a result of these climatic characteristics, many of the houses are painted white to reflect the sunlight. Venetian blinds or other win-

dow shades are extensively used in order to reduce the amount of light that may enter the house. The walls are thick and the roofs tiled in order to keep out the heat of summer. Since the winters are not cold, many of the houses are built with but meager provisions for heating, and the thick walls and the tile roofs are desirable to keep the houses warm in winter.

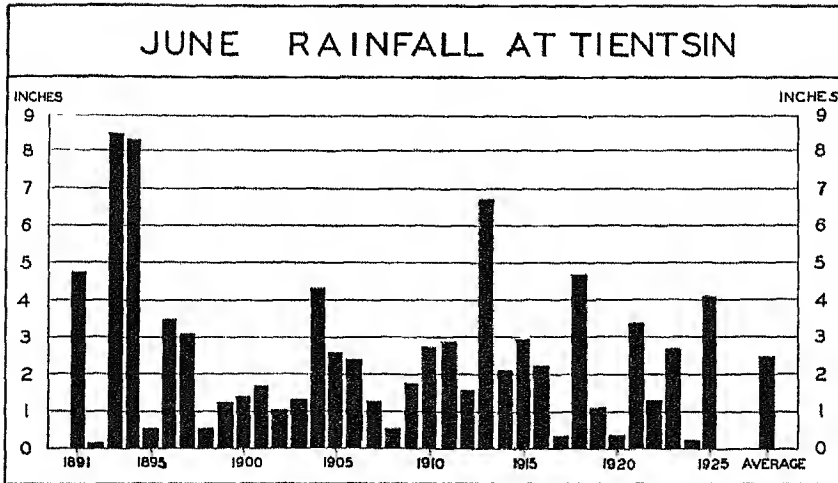
The foregoing illustrations are but a few of the many which might be given to show how houses have been adjusted to meet climatic conditions in many parts of the world.

WEATHER AND HUMAN WELL-BEING

Uncertainty of the weather. Of all the major geographic factors which influence human activities, weather is the least reliable. The uncertainty of weather conditions affects the entire human race. Hundreds of millions of people are seriously worried every day about their future welfare as related to weather conditions. Newspapers carry articles proclaiming the tragedy and heartaches caused by dust storms in the Great Plains, tornadoes in Texas and Oklahoma, floods in China, typhoons in the East Indies, hot dry winds in California, and frost in Argentina.

Weather hazards. While no part of the world is immune from adverse weather conditions, the hazards are worse in some regions than in others. During the past hundred years North China has experienced 40 years of famine as a result of adverse weather conditions. In this monsoonal area the winters are dry and the precipitation comes with the summer winds from the ocean. Here the proper amount of rainfall is the key to prosperity. Too little rain means crop failure and famine. Too much rain brings floods and also famine. It is little wonder, then, that each village has its rain god. The May and June rainfall are the most important, since these are the months when the crops are sown and get their start. The illustration on page 35 shows clearly the unreliability of the June rainfall at Tientsin, and the major cause of poverty, suffering, and famine within this densely populated area.

Crop production in Central and South China is but little more reliable than in North China, and famine frequently occurs in Central China and occasionally in South China. In years of heavy rainfall the Yangtze River floods vast areas and has at times driven from 10,000,000 to 30,000,000 people from their homes. Millions of

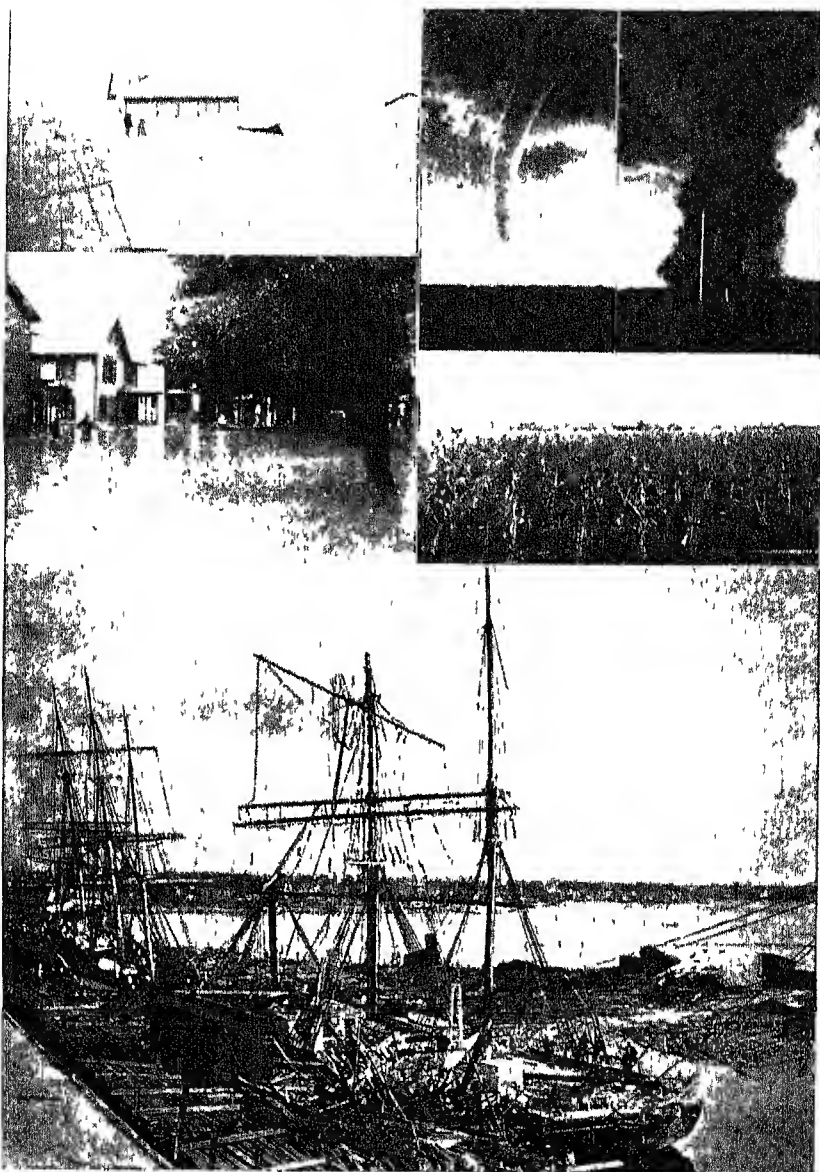


June is the most critical month for rainfall in North China. Yet during many years the June rainfall is too light to be of much value to crops, during other years the rainfall is so heavy that floods result. Droughts and floods are the major causes of famine in North China.

these people are unable to salvage food and other necessities of life from the flooded areas, and famine results. June and July are the critical months for rainfall in South China, and yet during this period the precipitation is exceedingly unreliable.

While the greatest weather hazard of China is unreliable rainfall, that for certain other parts of the world may be frost. Late spring frosts kill millions of dollars worth of fruit for American farmers each year. Early fall frosts destroy other millions of dollars worth of corn. The most destructive frosts of the United States occur, however, in citrus fruit and winter vegetable regions of Florida and California.

Thus on January 19, 1922, an unexpectedly severe frost in southern California destroyed \$50,000,000 worth of fruit in a single night. This frost brought financial ruin to thousands of farmers and resulted in great hardship to thousands of others. The damage caused by the California frost was probably surpassed by the "big freeze" which spread over Florida in December, 1934. On the day before the "big freeze" a bumper crop of Florida oranges and grapefruit was almost ready for harvesting; thousands of acres of winter vegetables were about ready for the market; and 16,000 acres of sugar cane were mature and the harvest season was at hand. These fine crops, all



Every human being is influenced by weather every day that he lives. What do these pictures tell you about the weather? A dust-buried farm (*top left*); flood in Bath, Maine (*center left*); two views of a tornado (*top right*); drought in North Dakota (*center right*); destruction caused by tropical hurricane (*bottom*). (Courtesy U. S. Dept. of Agriculture.)

awaiting harvest, caused the farmers of the state to feel prosperous and happy. Then, in a single night, a chilly winter blast spread waste and ruin among the farmers throughout the state. Silently, but with destructive force, frost swept through north and central Florida, with their fine citrus crops of the day before, and destroyed crops valued at millions of dollars. It even reached the vegetable and sugar cane districts that are situated immediately to the south of Lake Okeechobee.

The uncertainties of the weather, such as those experienced in China, California, and Florida, are not confined to a few regions. They are world wide and of great variety. The danger of droughts, floods, frosts, hot winds, dry winds, fog, heat, cold, tornadoes, hurricanes, and other weather hazards cause men to worry in all parts of the world. When the fears of adverse weather conditions become realities, they cause much suffering. Certainly no other geographic factor causes more worry, heartaches, and pain than result from the constant threat and frequent experience of adverse weather. (Illustration opposite.) On the other hand, no other geographic factor brings more happiness and exhilaration of body and spirit than results from favorable weather.

SUMMARY

As indicated by the foregoing study, climate and weather affect each human being every day he lives. They set broad limits to the nature of his occupation in any given region and influence the energy and forcefulness with which he works. They have an influence upon his health; they help design the type and character of his home; and they affect many phases of his home life. Finally, both climate and weather have much to do with man's degree of well-being and his state of mind. No attempt has been made in this chapter to give a complete and systematic discussion of the relation of climate to human well-being. The purpose has merely been to point out the importance of climate to man. The relation of climate to human welfare will be discussed in connection with each of the regional chapters which follow.

QUESTIONS AND EXERCISES

1. How does climate directly influence man?
2. List as many ways as you can in which climate affects man indirectly.
3. Explain how the weather of one region may affect human well-being in remote regions.

4. Write a 500-word composition on the relation of climate to houses
5. How does the uncertainty of weather influence human activity?
6. List as many ways as you can in which the hot, wet, equatorial climate influences man
7. Give a two-minute talk on the way in which climate affects some business that you know about.
8. Write a story on "Houses I Have Seen and Their Relation to Climate" or on "How Our Home Is Adjusted to Meet Local Climatic Needs."
9. How do weather conditions cause human suffering? Can you illustrate with pictures?
10. How do weather conditions bring happiness? Can you illustrate with pictures?
11. How does climate affect man in the temperate zones? How does it affect man in the polar zones? (Read Ward, R. DeC., *Climate*, pp. 272-337)

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Chapter 3

HOW PEOPLE USE THE LAND

USE OF AGRICULTURAL LAND

The meaning of land. The term "land" does not have the same meaning to all people. When mention is made of a "back-to-the-land" movement, people in general understand what is meant. In this phrase land suggests the source of agricultural products. It suggests fields and meadows. But there is also urban land, mineral land, and forest land.

What makes land valuable? In general, land has high value when it is productive and conveniently located. Crop land is generally considered productive when it has a favorable relief, fertile soil, and a good climate. Yet such land would still be of little value if it were located in an out-of-the-way place. The cost of producing a crop is



The Lewiston Orchards near Lewiston, Idaho, with cherry orchard in the foreground. Note the great contrast in land use between the bare, waste highlands in the background and the intensively worked orchard land in the foreground. (Photo by J. F. Anderson; courtesy Idaho State Chamber of Commerce.)

affected directly by the productivity of the land. Other things being equal, the cost of producing crops is lower in areas of fertile soil, suitable climate, and level to gently rolling land surface than in districts where these factors are unfavorable to production. Similarly, the value of mineral and forest land is determined chiefly by productivity and location. The richness and depth of deposits, their physical composition and chemical properties affect mineral productivity. The closeness and character of the stands of timber affect productivity on the forest lands.

The high value of Corn Belt farms is due largely to fertility of land. Both productivity and accessibility are important in determining land values. If geographic location were the only factor to take into account, then farm values in New England should be greater than those in the heart of the Corn Belt, since the New England farms are more favorably located with respect to the large industrial centers of northeastern United States. But statistics show that the average Iowa farm is valued at more than 10 times as much per acre as is the average farm in New England. This difference in value is due in large part to the greater productivity of the average Iowa farm.

Physical limits for agricultural land use. First of all, we must recognize the fact that there is a definite total land area for the world. This total area has been estimated at about 57,000,000 square miles, of which 6,000,000 square miles are located in the polar regions and are nonproductive. Under present conditions only two-fifths of the remaining 51,000,000 square miles of land is considered suitable for agriculture, and is therefore classified as arable land. But what about the remaining three-fifths of the world's surface area? This land is excluded from agricultural use because of one or more factors, such as rugged relief, low fertility of soils, insufficient amount of rainfall, poor drainage, and unfavorable temperature conditions. In some areas the land surface is too rugged for agriculture, since the steepness of slope sets an upper limit to the use of the land. In other areas infertile soils and poor drainage are limiting factors; whereas in still other places the climate is unfavorable for the production of crops.

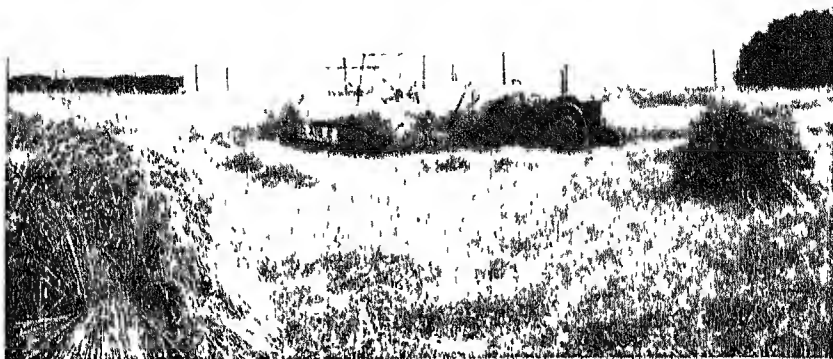
Nonphysical factors. Nonphysical factors should also be considered in determining the future use of agricultural land. Through scientific discoveries people are producing more food per acre of land by "making two blades of grass grow where one grew before."



Here in western Norway the crop land is limited to the valleys and lower high-land slopes. Note the use of land for hay, and the equipment used in haying. Only $3\frac{1}{2}$ per cent of Norway's land is suitable for crops, most of the unused portion being rugged highland. (Courtesy Natl Travel Assn of Norway)



Here in western Switzerland one finds a landscape somewhat comparable to that of western Norway where there is much waste land because of the mountainous character of the country (Photo by A. Kern; courtesy Swiss Natl. Tourist Office.)

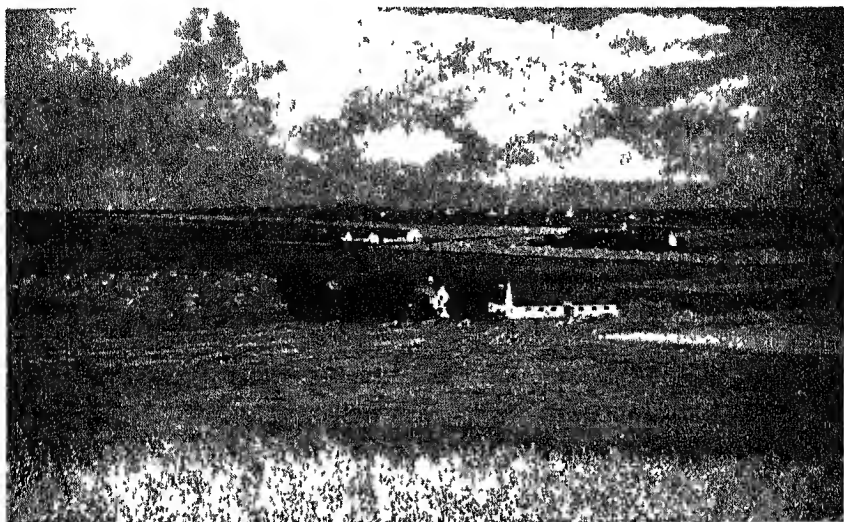


Equipment like this tractor and binder for harvesting grain is found in many of the agricultural districts of the United States and Canada (Courtesy J. I. Case Company)

Many fields of study are contributing to this development. Important discoveries are being made in scientific plant and animal breeding, in the use of fertilizers, and in the use of improved agricultural machinery. (Illus. above.) Moreover, increased knowledge about nutrition and the best use of food also has a bearing upon the upper limit of agricultural land utilization.

Agricultural land competes with other kinds of land. Finally, agricultural crops compete with the products of other extractive industries. Thus farm areas compete with land used for forest and mineral industries. In many agricultural districts tractors have taken the place of horses. Mineral land, therefore, which provides most of the raw material necessary for the making of tractors, comes into direct competition with agricultural land used for the production of feed for horses. Similarly, in many instances, wire and cable compete with cord, twine, and rope. The former are products of mineral land, the latter of crop land. These examples are sufficient to indicate that the future use of crop land must also take into account the ever increasing competition of the products of agriculture with those of the other extractive industries, and therefore with other uses of the land.

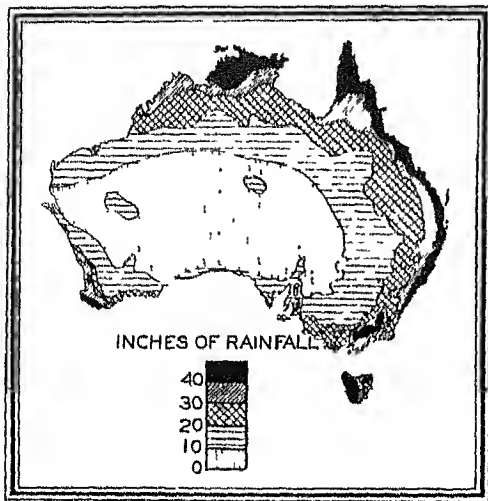
Agricultural land by continents. A study of the crop land of the various major land masses would seem to suggest that size is an important factor. Thus it is generally known that Asia is the largest of the continents, and it contains more cultivated land than is found in any other major land mass. But it is not a well-known fact that



A Danish landscape. Gently rolling areas, such as this one, are found throughout vast stretches of land in Europe. Here, land is used with great care. Most of the crops are produced as feed for dairy cattle. In the foreground is a field of oats—a crop that thrives in a cool, moist climate. (Photo by Jonals Company, Copenhagen.)

Europe, one of the smallest of our continents, ranks next only to Asia in number of acres of cropped land. North America, Africa, South America, and Australia follow in the order named.

Agricultural land in Asia and Europe That factors other than mere size are important must not be overlooked. Because of the importance of agriculture and the great number of people engaged in that occupation, density of population would also seem to be important. In fact, the rank of continents in cropped land is matched by their rank in population. Yet land surfaces and climate set broad limits beyond which crop production cannot be extended. The best developed agricultural lands of Asia are located where climate is most favorable, in the humid southern and eastern lowlands of the continent. On the other hand, the vast arid and semi-arid plateaus of central Asia are sparsely populated and have little crop land. Although Europe contains only a small total land area, most of her land is productive. (Illus. above.) There is but little land in Europe that is unproductive because of unfavorable climate and land surface. Europe surpasses all continents in proportion of lowland to total land area, as well as in average population density.



Average annual rainfall in various parts of Australia. Note the large areas of desert in the interior of the continent.

Climate and land surface limit use of land in South America and Africa. In South America and Africa rugged land surface and unfavorable climate are two of the foremost physical handicaps to the widespread use of the land. In the vast basins of the Congo and the Amazon, heat and humidity are barriers to progress. On the vast stretches of the Sahara the scant and irregular rainfall is the main handicap. In the Andes Mountains of

South America and in the highlands of East-Central Africa the upper limit of crop production is determined chiefly by rugged land surface and by high altitude.

Adverse climate limits crop land in Australia. In Australia the greater part of the interior consists of a tropical desert. (See map above.) Australia is about the size of the United States, yet it contains only 6,900,000 people, or 5 per cent of the population of our country. In the United States not more than 40 per cent of the land is rendered unproductive because of climate, whereas more than 70 per cent of the total area of Australia has an unfavorable climate.

IMPORTANCE OF POWER AND ENERGY IN THE USE OF LAND

Intensive versus extensive agriculture. The meaning of intensive and extensive agriculture as applied to the use of the land is not always clear. Some people think of intensive agriculture as small-scale farming; whereas extensive agriculture suggests large-scale enterprises. It is true that the small truck farms of eastern United States contrast strikingly with the large wheat farms of the Great Plains of our country in point of intensity of cultivation. On the





Much hand labor is required in the rice harvest of Japan (Courtesy Society for Visual Education)

truck farm there is much power—man power, machine power, or animal power—applied to each acre of land. On the average wheat farm of the Great Plains, however, each acre of land receives comparatively little power. Yet the total amount of power used in cultivating the entire wheat farm might equal that used on the small truck farm. On the wheat farm the power factor may be thought of as distributed thinly over many acres. Under such conditions agriculture is extensive in character. But how would we classify a large truck farm? Should such a farm be classified as an area of extensive agriculture merely because of its large size? The use of large machines does not determine whether land is used extensively or intensively. Whether the farm is small or large or whether it is worked by human, animal, or machine power matters not. The important question is whether much power or energy is applied on each unit of land. The agriculture, therefore, might be just as intensive in character on a large farm where labor-saving machines are used as on the small farm where the work is done chiefly by means of human labor.

Hand labor in the use of land. In some countries a large amount of human energy is spent on each unit of land. It can safely be said that at least two-thirds of the farm population of the world depends largely upon human labor. Nearly half of the world's people are



Hand labor used to thresh grain after the harvest in Japan (Courtesy Japan Tourist Bureau)

found in Asiatic countries where hand labor, as shown in the pictures, is the rule. In these areas one will find rather primitive instruments, most of which are made of wood. There is, of course, nothing wrong about the use of wooden materials, but we must observe the fact that people who use wooden tools cannot compete with the workers of the western machine civilization in either speed or capacity of agricultural production. Think of the impossibility of making anything like a Roosevelt Dam or a Boulder Dam with primitive wooden tools!

With hand labor and primitive wooden implements, relatively little land can be cared for by each worker. In districts where plowing must be done by means of a spade or similar equipment, it will take one man about two weeks to spade an acre of land. With a single plow which cuts a furrow a foot wide, a good team of horses can plow an acre in approximately half a day. With a tractor the time is much less, depending upon the number of plows that the tractor can draw behind it. If people who depend upon hand labor and primitive implements attempted to cultivate very large areas of land, they would find themselves using up much of the growing period in preparing the land. In other words, too much time would be consumed in preparing the land for crops and too little time would be left for the maturing of the crops before frost sets in.

Hand labor illustrated by China and Japan. Farming in China and Japan illustrates nicely some of the major principles which pertain



Tractors plowing in the vast land stretches of the Argentina Pampas (Courtesy International Harvester Export Company)

to the use of hand labor. In China the average amount of cultivated land per farm is not much more than three and one-half acres. In Japan the average farm contains less than two and one-half acres, and farms larger than 10 acres constitute less than 1 per cent of the total of all agricultural units. Just think of it! About as much land as farmers in the United States require for the production of grain and forage for a horse or a cow constitutes a farm in Japan.

Mechanical power and the use of the land. In areas where machine power is widely used, the work of plowing, cultivating, harvesting, and transporting crops takes place with great speed, which makes possible the use of widely scattered districts. (Illus. above) Agriculture under such conditions spreads out over large areas and much land is made available which would not be used where hand labor and primitive implements prevail. In short, the use of machines makes possible much more rapid movement on the farm where crops are produced as well as on the highways where they are hauled to market.

OTHER MAJOR USES OF LAND

Forest land. For the world as a whole, forests cover approximately one-fourth of the total land surface. In general, the largest forested areas are located in the humid tropical regions and in the humid parts of the middle latitudes. (Illus, p 48) In the humid tropical regions the virgin or original forests tend to predominate, since these areas have been but little exploited. On the other hand, the forest cover has been removed over large stretches of land in the temperate zone, as people have advanced in their search for tillable soil and for timber products.



Stand of Douglas fir in Cascade National Forest, Oregon. Some of the heaviest stands of timber in the world are found in the humid western part of North America. (Photo by D. C. Ingram; courtesy U. S. Forest Service.)

Climate as related to forests. For the world as a whole, climate appears to be the most important physical factor affecting the distribution of forests, although relief and soil should not be overlooked. Thus the regions of abundant precipitation have a forest cover, except where the forests have been removed by man. But moisture may be retained in the soil even in regions which have but a small precipitation, if such areas are favored by a low rate of evaporation. For example, in the northern coniferous forest regions of Canada and Eurasia the precipitation averages only seven to fifteen inches a year, yet the evaporation is so low that the soil

remains moist during the greater part of the year. Climate combines with relief in setting the upper limits to forest growth in some areas. Because of the decrease of temperature with increase in elevation, the higher parts of many mountains and plateaus are too cold for tree growth. On the other hand, in regions of low relief, such as in valleys, the soil and subsoil are in general more moist than in the interstream spaces. Thus trees are commonly found along the streams in the regions of semiarid grasslands.

That trees will grow on steep slopes is an important fact from the standpoint of land utilization. It has been found that fair stands of timber will grow on slopes of more than 40 degrees, whereas 20 degrees is generally given as the upper slope limit for agriculture. Because of the ability of trees to take root and grow on relatively



The semiarid plains of the United States and Canada are vast grassland areas—except along streams. This view of the Prince of Wales Ranch, Alberta, Canada, shows grass and shrubbery in the foreground, and a long line of trees growing along the stream that flows back of the buildings (Courtesy Dept of Interior, Canada)

steep slopes, forest land utilization has become an important factor in the struggle against soil erosion. Moreover, trees obtain their plant food mainly from the subsoil and from the air. As compared with crops, they do not rob the soil of as much fertility. It has been estimated that potatoes will take nine times as much potash from an acre of soil as will a stand of beech trees.

Urban land utilization. With the rapid growth of cities, urban land has become increasingly important. In 1880 the rural population of our country made up 71.4 per cent of the total; whereas in 1935 only 28 per cent of our total population lived in rural areas and only 22 per cent of the working population was engaged in agriculture. In some cities the population growth has been nothing short of phenomenal. Witness the growth of Chicago from a population of 550 in 1833 to approximately 3,500,000 a century later. As the population of the cities continues to grow the demand for urban land increases. In some cities this increased demand for urban land has been met at the expense of the adjacent agricultural areas. In other cities taller buildings have been erected and the area within the city has become more congested. With the further concentration of population and the demand for space, prices for city lots move rapidly

upward. Where land is most favorably located with respect to the rest of the urban center, as in the business districts of large American cities, building sites often sell for more than \$20,000 a front foot.

Importance of location in the use of urban land. Unlike agricultural, forest, and mineral land, the value of which is determined by both productivity and location, the chief factor determining the value of urban land is geographic location. In the very selection of a site for city development, location appears as a major factor. Within the urban centers location is the basis of rents as well as land values. Thus the centrally located districts of our large cities have high rents and high land values. Accessibility of sites within the city is a major factor in developing business establishments. For example, if the corner lot has three times as many people passing it as the lot in the center of the block, then the possible trade at the corner is also correspondingly greater. Thus the corner location becomes more valuable than the lot in the center of the block for attracting customers and trade.

Use of mineral land. Land used for mining covers a much smaller area than that used for agriculture. Yet mineral land more than any other type has contributed to our modern industrial civilization. It has been the most important factor in the development of the modern arts. The value of mineral land generally bears but little relation to surface area. Most minerals extend down into the rocks for a considerable distance, with but small dimensions of length and width on the surface of the earth. A third dimension—depth—must therefore be considered in regard to our mineral lands.

Because of the importance of minerals in the development of our present civilization, they are treated at greater length in the following chapter.

QUESTIONS AND EXERCISES

1. Give examples to show the importance of location and fertility in determining the value of agricultural land.
2. Name the physical and nonphysical factors that should be considered in determining the future use of agricultural land.
3. Give examples of agricultural land competing with other kinds of land.
4. Explain the fact that Europe, one of the smallest of the continents, is surpassed only by the largest continent, Asia, in amount of crop land.
5. Give reasons for the limited use of crop land in South America and Africa.

- 6 Although Australia is about the same size as the United States, its population is only one-twentieth as large as that of our country. Are there any basic factors that help explain this difference in size of population of these areas?
7. What is the meaning of intensive agriculture? Of extensive agriculture?
- 8 Why is the average Chinese farmer unable to care for a large acreage of land?
- 9 Of what importance is location in urban land use?
10. How does use of mineral land differ from that of other kinds of land?

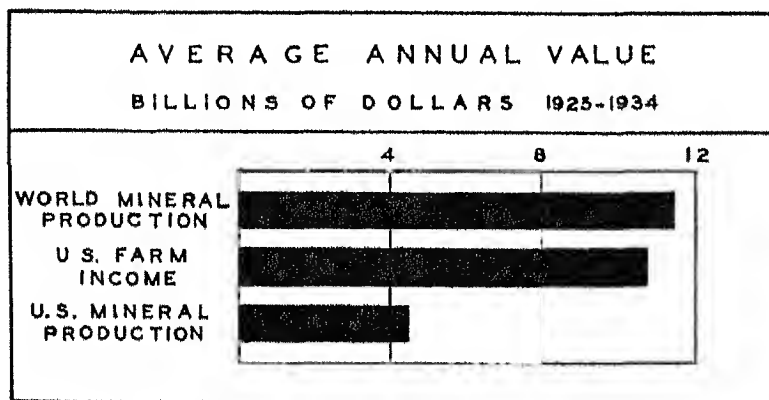
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SIGNIFICANCE OF MINERALS

Economic importance of minerals. When measured in terms of money the value of the total mineral output of the world each year is small as compared with the annual production of either plants or animals. Even in the United States, the greatest mineral-producing country in the world, the annual value of the mineral output is relatively small compared with the value of the agricultural products. (Chart below) However, the true value of minerals cannot be measured in terms of the monetary value of the annual output. Copper, iron, aluminum, stone, and other minerals may last for decades or in some cases for centuries, even though they are used continuously, whereas meat, wheat, vegetables, and other foods are used but once. Clothing may be worn for months or in some instances for years, but in general its life is short as compared with that of minerals.

Since the supply of minerals is accumulative, the total value of the amount in use becomes increasingly large. A farmer who purchases only \$300 worth of machinery annually, may, within a few years, possess \$3,000 worth of machinery. In many cases the total value of machinery (mostly made of minerals) used on a farm is



The average annual value of the mineral output of the world is but little greater than the average farm income of the United States.

greater than the annual value of the crop. Similarly, minerals are accumulated in other industries. Thus in 1937, the American Iron and Steel Institute estimated that more than 1,000,000,000 tons of steel were being used in the United States. At present prices of scrap iron this is worth more than \$20,000,000,000. The true value is much greater. The amount of steel in use per capita is the highest in the history of the country.

Some of the steel now in use was produced many years ago. For instance most of the 24,000 tons of steel used in building the Brooklyn Bridge was rolled in 1883, while many steel-framed buildings constructed before 1900 are still being occupied.

This accumulation of mineral products is taking place in every part of the industrial world. The United States leads in this respect. We already possess steel for approximately 250,000 miles of railroad track, copper for approximately 85,000,000 miles of telephone and telegraph lines, steel, copper, stone, and other minerals for millions of homes, and tractors, binders, and other machinery for millions of farms. A considerable percentage of these minerals will be in use 10, 50, or even 100 years hence. On the other hand, last year's crops will soon be gone. This accumulative effect of minerals, which may be utilized for an indefinite period of time, contrasts sharply with the perishable nature of most agricultural products which can be utilized but once, or at best for only a short time. Therefore, in spite of the small annual output of minerals, the monetary value placed on the total mineral supply now possessed by the American people is several times that of all the agricultural and pastoral products now possessed by this great nation.

Social importance of minerals. It will be understood from the following discussion that a large-scale use of minerals is absolutely essential to an achievement of high standards of living for the masses of people in any region. However, the large-scale use of minerals does not guarantee high standards of living, since minerals may be used for destruction as well as for construction. Nations may use iron, steel, aluminum, fuel, and other minerals for the production and transportation of the necessities and luxuries of life and thereby aid materially in supplying the masses of people from the "horn of plenty." Nations may, on the other hand, use these minerals for the manufacture and use of battleships, cannons, tank cars, bombing planes, and munitions with which to destroy goods and thereby to reduce the masses to want and poverty. The large-scale use of

minerals, accordingly, may be a blessing to the masses of the people or it may bring them poverty and misery. On the other hand, it is impossible to achieve high standards of living without the large-scale use of minerals. A little further study may help to clarify this point.

The possession of minerals has long been a vital factor in the growth of nations. The predominance of Spain in the sixteenth century was based to no small degree on her mineral resources. The steady flow of gold from Mexico, Peru, and other parts of the New World into the treasury of Spain aided that country in continuing her explorations and conquests.

From that time to this minerals have played an important part in world history. Prospectors have explored the desert, the frozen Arctic, and the tropical wilderness in search of precious metals and stones. Society has been altered in many ways because of the search for minerals and of their production and utilization. The lone prospector, the people living in mining towns, and those in iron and steel manufacturing cities are not the only ones whose social lives have been influenced by the use of minerals. The automobile, telephone, telegraph, and railway, all dependent upon minerals, have revolutionized society.

Minerals and the Industrial Revolution. The Industrial Revolution was based on the substitution of machinery for human hands and of mechanical power for the muscular energy of animals and man. Practically all machinery, whether it is used for manufacturing, mining, quarrying, lumbering, or agriculture, is made wholly or in part from iron, and other minerals. A very large percentage of all of the power used to propel the machinery is produced from coal, lignite, petroleum, natural gas, or falling water (hydroelectric power). Thus the mineral industries are the very foundations of the Industrial Revolution.

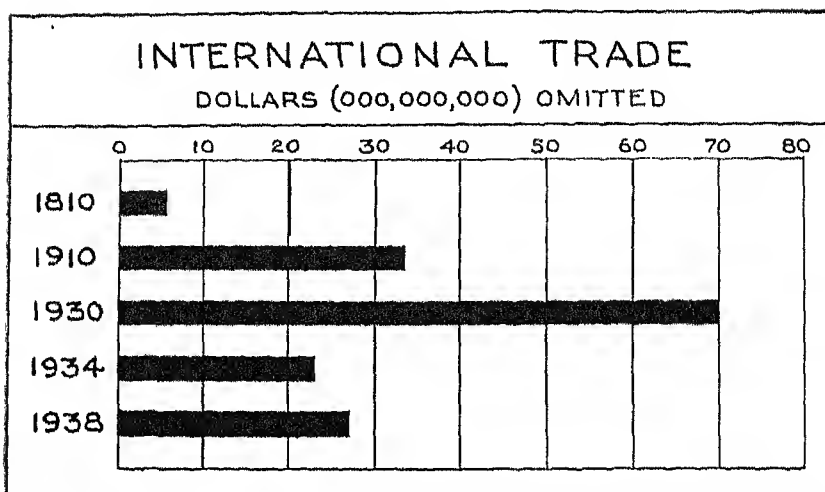
For many purposes the use of this machinery has multiplied the productive capacity of man ten, twenty, and even a hundredfold. Wherever man or animal power is depended upon to do most of the work, the masses must remain poor in worldly goods. These conditions are well illustrated in large parts of India, China, Africa, and Latin America where most of the work is still done by human effort. Truly under such circumstances man lives "by the sweat of his brow." On the other hand, within the great industrial regions of the world, man has put millions of mechanical slaves (machinery and

mechanical power) to work doing his bidding. When wisely used, this machinery makes it possible for man to have an abundance of goods, comfortable homes, automobiles, radios, bathtubs, and other useful things that he could not have otherwise. In addition, it gives him more leisure time that may be profitably used for recreation and for the improvement of the world.

Minerals and transportation During most of the time that man has existed on the earth, he has been compelled to move to the vicinity of the resources he used, rather than to bring the resources to him. It was impossible to do otherwise as long as human beings and animals were the chief burden carriers. Prior to the year 1500, the long-distance trade of the world amounted to but a few million dollars a year. This trade was primarily in spices and precious and semiprecious stones and metals. Such conditions meant poverty of resources, since no one small section of the world possesses a very large variety of resources. No one region is suited to the production of wheat, corn, meat, vegetables, bananas, sugar, apples, oranges, rubber, cotton, and the great variety of other agricultural and pastoral products utilized by the average American schoolboy and girl almost every day. The same conditions hold for the products of the mine, forest, and sea. The task of assembling these raw materials in any given community, so that they may be used by the average citizen, requires a tremendous amount of energy—far more energy than could be supplied by the muscular efforts of man and beast. Consequently, during most of the long period of human history, man has moved to the bulky raw materials he used.

Modern transportation facilities have recently revolutionized our method of living. Mechanical energy, operating with great power and speed, is used to transport raw materials to man. At present, in order to transport these products from the place of origin to the American consumer, about 800,000 freight cars, several million trucks and automobiles, thousands of steamships, and thousands of airplanes are loaded with goods every week. These goods are shipped distances ranging from a few miles to several thousand miles. Something of the growth of trade since the beginning of the Industrial Revolution is indicated by the illustration on page 56. It should be remembered, however, that the amount of local and national trade is many times as great as the international trade.

The movement of these goods would be impossible without the use of metals. Every method of cheap and efficient transportation today



International trade increased more than 100-fold between 1810 and 1930. However, during the depression years (1930-38) world trade declined sharply

is absolutely dependent upon the utilization of iron, fuel, and other minerals. The railroad, steamship, pipe line, automobile, and airplane are all made, at least in part, of iron, steel, copper, aluminum, or other minerals. Without the use of these minerals for the manufacture of steam engines, gasoline motors, freight cars, automobiles, and airplanes we should be compelled immediately to fall back on man and beast to transport products on land, and we should need to use the sailing vessel again for transportation on the sea.

The use of such ancient methods of transportation would result in the masses of the people having to depend, as in ancient times, upon the resources of their own locality for the necessities and the luxuries of life. Poverty would be the inevitable result. The people of the great cities would have to move back to farms where they could produce their own food, clothing, and shelter. They would be compelled to do without most of the luxuries of life because of the impossible task of assembling the raw materials out of which they are made.

Minerals and world-power. Perhaps there is no field of human activity in which the supremacy of a nation or group of nations is more dependent upon the large-scale use of a variety of minerals than that of war. Successful naval and military operations, today,

must rely largely upon the ability of a nation or of several nations, as the case may be, to bring into use superior fighting equipment. Cruisers, dreadnaughts, submarines, tanks, bombing planes, guns, both large and small, and other munitions of war are wholly, or in large part, made of minerals. The quick movement of troops and supplies necessitates trucks, automobiles, hard roads, railroads and railroad equipment, merchant ships, and other modern facilities for rapid transportation. Modern warfare demands petroleum and coal products for the lubrication of machinery and for power. It necessitates the use of nitrates for the manufacture of explosives. Machinery for the factory and farm are all in demand, so that a large part of the man power of the nation can be sent to the fields of battle. Men, food, and clothing are all a necessary part of war; but supremacy in this field of destruction, just as in the various fields of construction, necessitates the use of tremendous quantities of minerals.

As in war, so in most of man's industrial activities, modern machinery is the symbol of power. It represents power in agriculture. One rice farmer in Louisiana or Texas, with the aid of modern machinery, may produce as much grain as is grown by 10, 20, 30, or even 60 Chinese farmers who have meager facilities for work. Machinery represents power in the mines. Each coal miner in the United States, with his modern drilling, blasting, cutting, and loading machinery, produces five times as much coal as is produced by the Japanese miner, whose principal tools are the pick and shovel. Machinery represents power in transportation. In the United States a few men with modern railroad facilities may move thousands of tons of freight over distances of several hundred miles in a single day. Compare such transportation facilities with those that exist in large sections of North China, where the wheelbarrow is the most common vehicle for the transportation of freight. How much coal and iron could we transport by the methods used in backward parts of Africa, where man is the chief beast of burden? In a similar manner it may be shown that modern machinery is representative of power in most of the other industrial activities of man.

Relative importance of various minerals. More than 100 minerals are now considered necessary to the well-rounded economic development of such industrial nations as the United States and the great powers of western Europe. More than 50 minerals have been designated as essential to the successful prosecution of warfare. However, some minerals are of much greater value than others.

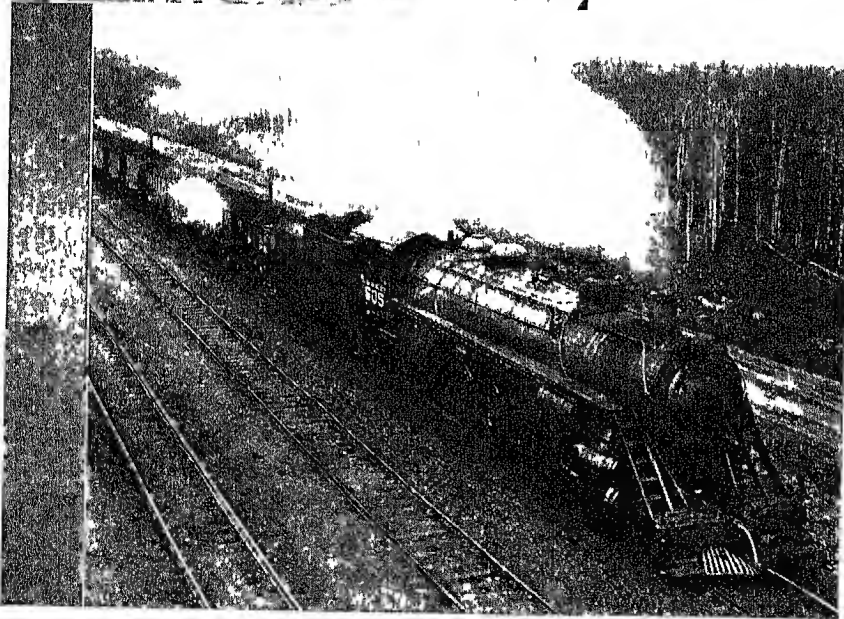
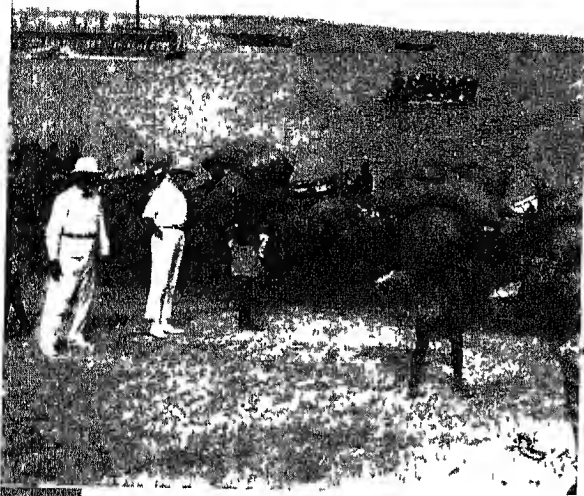
Major minerals. Today, iron for the harnessing of power and for the manufacture of tools, and mineral fuels for the creation of power are the very foundation of all major forms of modern industrial activity. In recent years the world's pig iron production is two to four times as valuable as the world's gold output, while the world's mineral-fuel output is 10 to 15 times as valuable as that of gold. Moreover, since the beginning of the Industrial Revolution the curve of production for iron and mineral fuels has risen much more rapidly than that of gold. Industrial power cannot be built upon gold and silver. In fact, it could without doubt be developed without them. There could be no hope of such development without iron and mineral fuel.

Second in importance is the group of minerals, copper, lead, and zinc. These metals are used in such a vast range of manufacturing, refining, and construction operations that they have become scarcely less vital than iron and fuel to modern industry. The simple example of millions of miles of copper wire used for rapid communication, and millions of batteries (containing lead and zinc) necessary for the operation of automobiles and radios, will illustrate something of their importance.

Next in importance to the three metals mentioned above should be ranked salt and the fertilizer group—phosphate, potash, nitrates, calcium, and sulphur. As the population pressure increases, and as the soils become more and more impoverished, the mineral fertilizers are likely to become of increasing importance if the world is to be well fed and well clothed. Already the use of these minerals is increasing at a rapid rate. Sulphur, which is used very largely in the manufacture of fertilizers, is also used in scores of manufacturing and refining industries. Salt is not only necessary to life, but its use is basic to many manufacturing industries.

Perhaps the only other minerals that should be classified among the major group are the construction minerals—stone, clay, asphalt, and especially cement (a semimanufactured product made by the use of several minerals). It has not been common practice to classify these minerals among the major group. However, they are used in such large quantities and are so important for construction purposes in every great industrial center that they are here classified with the major minerals. The world's consumption of cement alone approximates 75,000,000 tons a year during prosperous years. No one of these minerals used for construction is indispensable, since others

CONTRASTS IN
METHODS OF
TRANSPORTA-
TION



Much of the cacao being loaded by porters (*top*), has been carried long distances by carriers. More than 100,000 porters would be needed to carry the iron ore being pulled by one engine (*bottom*). The men could carry the load ten miles a day; the engine pulls its load thirty miles an hour. (Courtesy U. S. Dept. of Agriculture and Duluth Chamber of Commerce)

may be substituted. As a group, however, they are of major importance.

Since 1885, iron production within the United States has increased five times as fast as the population, whereas the output of Portland cement has increased almost 100 times as fast as that of iron and 500 times as fast as that of the population. More tons of cement than of iron are now produced in the United States. Concrete has replaced iron in certain kinds of construction, and in turn the building of concrete highways has stimulated the use of steel for the manufacture of automobiles, the increased number of which is due in part to the improvement of the roads.

Minor minerals. No other groups are so vital to national power and social welfare as those discussed in the foregoing paragraphs. The importance of minor minerals is therefore only "minor" as compared with the major groups of minerals. Many of the minor minerals are exceedingly valuable, and some are classified by war boards and large industrial firms as "essential" minerals. Indeed, they are essential if we are to maintain our present high standard of living.

Steel alloys. Something of the importance of minor minerals is indicated by the use of certain metals for the manufacture of steel alloys. Nickel, vanadium, or chromium, when added to steel, results in a product (steel alloy) which is much harder, tougher, or more resistant to rust than is pure steel. Several other minerals are used to make steel alloys that have other characteristics that are especially desired. Without these alloys our standards of living would be lowered immediately, and our national strength would be impaired. Steel alloys are discussed more fully in Chapter 14.

Scores of other minor minerals have so many valuable uses that pages would be required in order to list them. Enough has been said, however, to indicate that the term "minor" as applied to these minerals is a relative term only. Yet the loss of the use of vanadium, nickel, asbestos, or any other minor mineral would be negligible to the world as compared to the loss of the use of iron, coal, petroleum, or any other major mineral.

Location of major minerals as a factor in industrialism. The well-rounded industrial development of any nation necessitates the large-scale use of every major mineral. The world's consumption of each of these minerals is measured in millions of tons. Fortunate, therefore, is the nation that possesses or can obtain from neighboring countries a supply of all or most of them. The United States is the

only country in the world that is known to possess a large supply of major minerals, and while we import annually a few million tons, such action is not necessary. We have within our own borders a sufficient quantity of all of these valuable resources to last for decades, and in some cases for centuries, so that if the outside supply were to be suddenly cut off, as might happen in the case of war, the loss would not leave us in want.

Western Europe is the only other part of the world that possesses a fair supply of most of the major minerals. Unfortunately, no individual country of western Europe is so abundantly blessed as is the United States in this respect. Sweden has the finest iron ore reserves of Europe, but she lacks most of the other major minerals. Germany possesses the most valuable coal deposits of Europe, but has almost no iron ore. England has fine coal fields and a fair supply of low-grade iron ores, but she must depend upon the outside world for practically all the copper, lead, zinc, and fertilizers that she needs. Normally, she also imports large quantities of iron ore. Similarly, every nation in Europe must depend upon the outside world for a large part of her major mineral supply.

Location of minor mineral resources and industrialism. The location of the source of the minor minerals is, in normal times, a matter of comparatively slight importance, since they are used in relatively small quantities. Hence the cost of transporting them from the region of origin to the center of consumption is not burdensome. This fact is clearly illustrated by this table:

AVERAGE ANNUAL CONSUMPTION OF SELECTED MINERALS
IN UNITED STATES, 1941

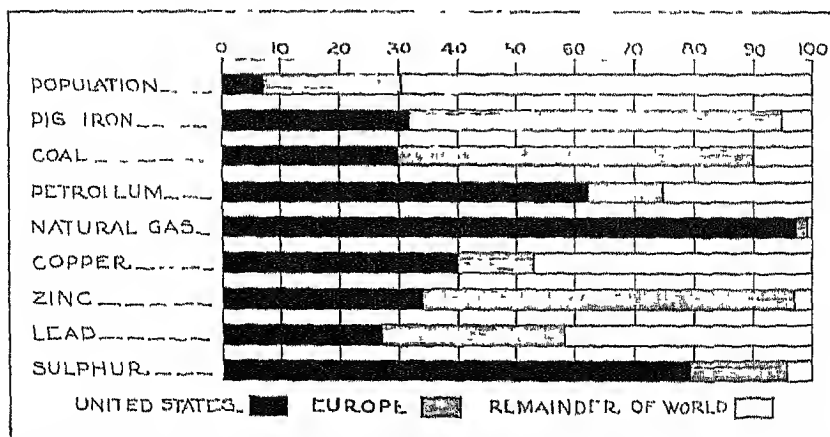
Natural gas (cubic feet)	2,667,000,000,000
Petroleum (barrels)	1,352,000,000
Coal (tons)	556,000,000
Iron ore (tons)	73,000,000
Manganese ore (tons)	3,401,000
Sulphur (tons)	1,848,000
Copper (tons)	1,070,000
Lead (tons)	782,000
Zinc (tons)	677,000
Chromite (tons)	600,000
Tin (tons)	123,000
Antimony ore (tons)	15,930
Tungsten (tons)	15,300

The task of importing our present annual requirements of 500,000,000 to 600,000,000 tons of coal and iron ore from remote portions of the earth would be superhuman. Similarly the task of importing two trillion cubic feet of gas and a billion barrels of petroleum would be almost or quite beyond the power of man. But our national requirements of the most bulky of the minor minerals represent but a few shiploads.

PRODUCTION OF MINERALS

Trends of production. In the first pages of this chapter it was pointed out that minerals play a dominant role in human affairs. Further study indicates that this role has become of increasing importance each decade since the beginning of the Industrial Revolution. In the year 1700, the value of the entire mineral output of the world certainly did not exceed \$100,000,000. During the 10 years, 1925 to 1934 inclusive, the average annual value of the output was approximately \$12,000,000,000, or 120 times the value of the output in 1700. During the same period, 1700 to 1934, the population of the world has increased only threefold. In other words the average per capita use of minerals today is probably 40 times that of 1700.

Distribution of production. The per capita production of minerals



The United States and Europe support but a small percentage of the world's population, but they produce a large percentage of the world's output of major minerals. In addition, American and European capital control the production of a large percentage of the minerals produced in other parts of the world.

is by no means uniform throughout the world. Most of the world's output of major minerals is mined in countries tributary to the North Atlantic Ocean, with the United States leading all the other great nations (Chart opposite) This great country, with but 7 per cent of the world's population, produces from 30 to 98 per cent of the seven most valuable mineral products of the world. This fact helps to account for our unequalled prosperity and power. During the 10-year period, 1925-1934, the average annual production of minerals within the United States exceeded \$37 per capita, whereas in the remainder of the world it scarcely amounted to \$4.00 per capita, or only about one-ninth as much.

The mineral production of the outside world is by no means equally distributed. Thus in Great Britain the per capita production of minerals in a prosperous year approximates \$20, whereas in India and its dependencies it is less than 30 cents. The annual per capita production of 30 cents worth of minerals in India contrasts strikingly with the \$37 worth within the United States. These figures are representative of the differences in the state of industrial development within the two countries. The 30 cents of India as compared with \$37 in the United States does not, however, tell the complete story. In addition, because of our accumulation of minerals, the average American is constantly utilizing approximately \$270 worth of minerals as compared with \$3.00 or \$4.00 worth in India. The contrast between parts of western Europe and eastern Asia is almost equally great.

NATIONAL CONTROL OF MINERALS

Political control. During the past few decades the struggle for the control of the mineral resources of the world has been constant and at times bitter. This struggle has been partly political and partly commercial. The Lorraine iron ore deposits, Saar coal fields, Persian oil field, and Silesian ore deposits are representative of resources over which bitter political struggles have been waged. These resources have been passed from one nation to another very largely by the commands of the gods of war. To the victor belong the spoils.

Commercial control. The desire of individuals for commercial control of minerals is just as acute as that of the nations for political control. One of the chief aims of almost every economic organization is that of growth. When conditions are favorable for growth, the

organization may reach gigantic proportions and extend its influences far beyond national bounds. Such has been the case of many of the mineral-producing companies of western Europe and of the United States. Some of the American petroleum corporations possess oil fields in many remote parts of the world, copper companies have expanded far beyond our national boundaries and have brought under their control copper resources in Chile, Central Africa, Canada, and other foreign lands, and large American steel companies have purchased or leased mineral properties in distant parts of the world. European companies have also gained control of mineral resources in almost every country in the world.

Advantages for control. The United States and western Europe possess many advantages for the world-wide control of mineral resources. Both areas are well suited to the development of powerful mineral industries. Both areas are rich in a variety of minerals; they have a large demand for these products; capital is adequate for undertakings of almost any size; and the people are energetic and competent. No other parts of the world have all these advantages.

The reason for the expansion of American and European companies into foreign fields is not difficult to understand. For example, when copper ore was discovered in Central Africa it was clearly seen that vast amounts of capital would be needed to open up the reserves. Railroads had to be built, machinery had to be shipped to the field, and it was necessary that many other expensive operations be completed before copper ore could be mined profitably. Only powerful corporations could afford such an outlay of capital. It was only natural, therefore, that the copper companies of the United States and of western Europe would be called upon to undertake the exploitation of these reserves.

When the copper companies of the United States became powerful they began to extend their influences to distant parts of the world. Wherever rich copper deposits were discovered, American companies were among the first to seek control of part or all of the resources. As a result two American companies have in recent years controlled almost one-third of the world's copper output; and American capital probably controls 70 per cent of the copper mining properties of the world.

In a similar manner a large percentage of the mineral production of South America, Africa, and Asia is under the control of western European and American capital. It has been estimated that fully

three-fourths of the world's mineral production and proved reserves are under the control of the governments or of commercial organizations of the United States and Great Britain alone. Most of the remainder is under the control of commercial organizations of other western European countries. It is probable that today 95 per cent of the mineral-producing properties of the world and an equally great percentage of the mineral output are controlled within the United States and European countries.

UTILIZATION OF MINERALS

The concentration of the utilization of minerals is even more marked than the concentration of production. For example, Chile, Bolivia, and Malaya are all large producers of minerals. However, almost none of these minerals are used locally. Instead, they are shipped to nations bordering the North Atlantic to supplement the local supply of these countries.

As previously stated, the supremacy of a people, either in the constructive pursuits of commerce or industry, or in the destructive pursuits of war, necessitates the large-scale use of minerals. Power, however, may be either a blessing or a curse. If the countries bordering the North Atlantic Ocean are capable of using the minerals which they control in peaceful pursuits, the entire world may reap material benefits. If, on the other hand, they turn these minerals into implements of war, Western civilization may quickly destroy itself, and at the same time bring great suffering to the remainder of the world.

QUESTIONS AND EXERCISES

1. Write a 500-word composition on the mineral industries of a country as related to standards of living.
2. How do minerals contribute to the industrial and commercial strength of a nation?
3. How do minerals contribute to world power?
4. What major problems arise from the fact that a few nations control most of the mineral output of the world?
5. What minerals are most important? Why?
6. Why is it more important to have a local supply of major minerals than to have a local supply of minor minerals?
7. What countries control most of the world's mineral output? How was this situation brought about?

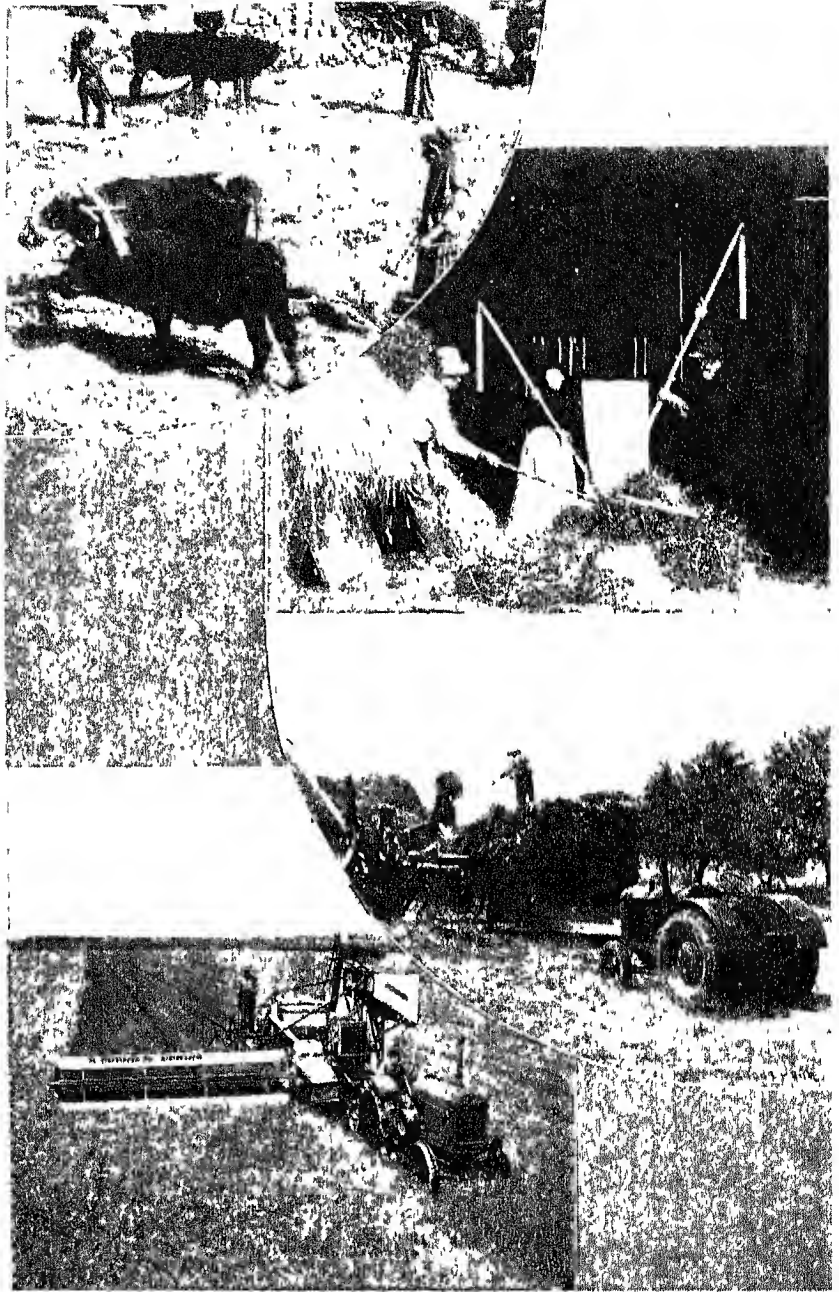
- 8 Why do many countries export most of the minerals they produce instead of using them at home?
- 9 The United States is the richest and most powerful nation in the world. What geographic factors have contributed to this supremacy? In answering this question give consideration to all the chapters you have thus far studied.
- 10 How does the use of minerals influence social conditions? Give some illustrations.
- 11 To what extent do modern methods of transportation and communication depend upon minerals? Can you find out how many minerals are used in the manufacture of your telephone, automobile, or radio?
- 12 Write a composition on the subject: The Minerals Used in Our Home Each Day.
- 13 How do minerals influence the activities of man? (Read Whitbeck, Roy H., and Thomas, Olive J., *The Geographic Factor*, pp. 174-233.)

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- Voskuil, W. H., *Minerals in Modern Industry*, John Wiley and Sons, 1930.
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- World Atlas of Commercial Geology, Part I, U. S. Geological Survey.

Part II

THE UNITED STATES AND
CANADA



Contrast between the old (*upper pictures*) and the new (*bottom pictures*)
These pictures illustrate one of the reasons why the United States is a great
and powerful country. (Courtesy International Harvester, J. I. Case.)

THE UNITED STATES AMONG NATIONS

Economic well-being. From the standpoint of economic well-being, the United States is the foremost nation of the world. Our economic standards are higher than those of any other nation. Indeed, they are higher than have ever been experienced by any other country throughout the ages. The average citizen during normal times enjoys more of the necessities, conveniences, comforts, and luxuries of life than are possessed by the peoples of any other country, and more than were possessed by royalty a century ago.

These are facts about which the people of the United States have just cause to be proud, but about which they cannot afford to boast. In appraising the present superior economic position of this nation it must be remembered that, no matter how masterful a people may be, they cannot create a great and powerful nation without the possession of appropriate raw materials with which to accomplish the task. In this respect a nation may be compared to a bridge or a building. No one but a great engineer could properly design the bridge that spans the Hudson River, or the skyscrapers that have been erected near its banks. But the greatest engineer in the world could not build such structures without the use of suitable materials. Similarly, it requires a capable people properly to design a great and prosperous nation like the United States, but it also requires an abundance of raw materials with which to build it.

No other country has ever had such favorable opportunities for economic development as those possessed by the United States. The country is occupied by a progressive people, it has greater resources per capita than are possessed by any other nation, and our climates are among the most invigorating to be found anywhere in the world. These advantages have given us overwhelming opportunities for economic and industrial greatness. The term "overwhelming" is selected to describe these opportunities because we have not used our vast resources to the best advantage of all our people. Consequently, millions of citizens have at times been in want in the midst of plenty. It is acknowledged by all who have given thought to the subject that this want has not resulted from any shortage of mate-

rials not from our inability to produce enough to satisfy the needs of all. Any poverty of our people must be attributed largely to the improper functioning of society. That is, to the inability of society to permit every able-bodied person to produce efficiently, and to secure for himself and his family the major benefits derived from his labors. With minor exceptions, any lack of human well-being certainly cannot be attributed to a shortage of economic raw materials, nor to adverse environmental conditions.

THE UNITED STATES—A COUNTRY OF OPPORTUNITY

A gift of the gods. J. Russell Smith in writing of the Corn Belt has called it "a gift of the gods." This term might also be applied to the United States. It is a gift of the sun god, the rain god, the mineral god, and other gods of plenty. When Columbus discovered America, this rich territory, which has since become the United States, was practically unoccupied and was awaiting peoples who could make use of its abundant resources. Three million Indians roamed over 3,000,000 square miles of land, but they did not understand about the wealth of resources over which they trod. These resources have recently become the heritage of a capable people.

A worthy gift to a worthy people. Who were the men and women that a little more than 300 years ago commenced the development of this little occupied and almost unused land? A study of Colonial development indicates that the early colonists were home-builders of initiative, daring, and resourcefulness. They were men and women who were physically fitted to stand the hardships of pioneer life. The physically weak, the timid and dependent, the mental and moral coward, and the ne'er-do-well never fit into this picture of frontier life. Among the most important forces that attracted the pioneer to our shores were a desire for religious, political, and economic freedom, and a longing for social equality. The American Frontier, which did not disappear until about 1890, always afforded a large measure of freedom and independence to the peoples who had enough courage, physical stamina, and resourcefulness to contend successfully with pioneer conditions.

Ease of transplanting European culture to the temperate lands of North America. The European pioneer found a comparatively hospitable land awaiting him when he landed in the territory which

is now known as the United States. He encountered no new diseases on the mainland north of the Rio Grande River. Relatively few Indians occupied the land, and they were easily pushed back in order to make room for the white man. Moreover, the Indians' mode of living was such as to help the European make a quick adjustment to his new home. The Europeans found the Indians making a living by growing corn, potatoes, tobacco, and by hunting and fishing. The needs of the colonists were few, and they were willing, at least for a time, to adopt in a very large measure the Indians' method of living.

Corn was the perfect frontier crop for the early colonists. It could be planted in the deadened forest, would yield a large food return for the labor expended, and did not have to be harvested at any specific time. If, at harvest time, the colonists were busy building homes, hunting, or protecting their homes against the Indians, the corn could be left in the fields, with but little injury, for months after it had matured. Corn could be prepared for food in many different ways. It could be eaten before maturity as roasting ears; or after it was ripe it could be parched or made into hominy or cornbread. By feeding it to hogs and cattle it could be turned into meat or dairy products. The fodder made good feed for animals and was at times used as siding and roofing material for sheds to shelter the horses and cattle. As these animals ate the sides and roofs of the sheds away, more fodder was added. Corn was not only an ideal crop for the colonists, but it has ever remained America's foremost agricultural product.

The potato, only slightly less valuable to the colonists than corn, soon became one of the foremost food crops, not only of North America but of the Western world. Tobacco, another important contribution of the Americas, soon became the foremost commercial crop of the New World. Its export gave the colonists money with which to purchase European goods. The forests were rich in game which supplied meat for home consumption and furs both for local use and for export. And, finally, the shallow waters off the Atlantic Seaboard were among the finest fishing grounds to be found anywhere. These conditions greatly simplified the task of our pioneer forefathers in adjusting themselves to their new surroundings.

The colonists, however, made valuable additions to the resources of their new homeland. They brought with them horses, cattle, sheep, goats, hogs, and poultry. They also introduced wheat, rye, barley, rice, apples, and many other European crops, all of which

were formerly unknown to the American Indian. The successful introduction of these animals and crops was accomplished with relative ease, since the new environment in America proved to be as well suited to them as was the old environment of Europe. This combination of American and European crops and animals laid the foundation for a richness in the variety of agricultural products unsurpassed by any other country.

Land ownership and opportunity for the development of a middle class. Very few events in the history of our country have been of greater significance than the methods by which the United States Government disposed of its land. During the period 1800 to 1820, the United States Government, in order to encourage its citizens to hold property and especially to own homes, sold land in 120-acre tracts at \$2.00 an acre. After 1820 the policy was changed and 80-acre tracts were sold at \$1.25 an acre. The American frontiersman, however, objected to the payment of even these low prices for land. He felt that the unused land should be free. Consequently, tens of thousands of families went into empty territory, staked off pieces of land, built houses, and stocked the land with horses, cattle, sheep, and hogs. Such farmers were called "squatters." Although they had paid nothing for their homes, they had labored on them and were ready to defend them against other claimants. So many "squatters" settled in the country that finally the government passed a homestead law which gave an 80-acre farm to any citizen who would take it, live upon it, and in specified ways improve it.

This homestead law gave an opportunity to every American citizen to own a farm sufficiently large to support a family in moderate circumstances. Later, as the farmers began to move into the semiarid portion of the United States, they found that 80 acres were not enough for the support of a family. Consequently, the law was changed so as to give 160 acres and finally 320 acres to each citizen who desired them. Largely as a result of these excellent homestead laws, the agricultural land of the United States is now divided into more than 6,000,000 moderate-sized farms. The average size of these farms is about 147 acres.

Thus there grew up a rural society of independent and industrious landowners who had a financial interest in their country. These landowners were also home-builders. They built comfortable homes for themselves, provided schools for their children, built churches, constructed roads, and in other ways developed a type of rural society

which has become one of the most substantial and respected groups in the life of our nation

Land ownership in the United States contrasted with that in Latin America. Compare rural conditions within the United States with those south of the Rio Grande River, where most of the agricultural land passed into the possession of a few thousand wealthy land-owners, and where as a result the masses of people have no opportunity to own land. At one time most of the land of Mexico was owned by 4,000 families, while millions of natives owned no property except their clothing and a few personal belongings. In Argentina, 25,000,000 acres of land were disposed of, at one time, in blocks of 100,000 to 500,000 acres each. Some of these large blocks of land have never been divided and form some of the largest estates of Argentina today. In a similar manner, most of the land of other Latin American countries passed into the hands of the rich or powerful, leaving the masses of people without land. Recently the large estates of some of these countries are being divided. These changes are of such recent origin, and have taken place on such a small scale, that they have not yet had any profound influence upon the nature of society.

The unfavorable influences of large estates is perhaps best illustrated by the land-holding system of Mexico prior to 1922, that is, before the government had announced the policy of giving vast estates to the landless. Before this change began to take place the Mexican estate, known as the hacienda, was aristocratic in management and similar in many respects to the old-world baronies of the Middle Ages. Each hacienda was a law unto itself, developed its own institutions—churches and schools—produced its own goods, and in many respects constituted a distinct social and economic unit.

Some of these estates contained millions of acres each. The land of each hacienda was owned by one family, but the many small assemblages of huts scattered over the estate indicated that it was the home of hundreds or perhaps thousands of peons. The activities of these peons were controlled by the landlord much as those of small children are directed by their parents. There were differences, however. Children are encouraged to think and act for themselves, whereas very few of the peons of large estates were given this opportunity. The normal parent desires that his children mature into upright, capable, independent, resourceful, and prosperous men and women. The owner of a vast hacienda too frequently desired to keep

the peon dependent, submissive, and even ignorant, in order that he might the more willingly work for his master. Such peons do not make good citizens. As previously pointed out, these conditions are gradually being changed in Mexico and other Latin American countries.

This striking contrast in the nature of land ownership in the United States as compared with that south of the Rio Grande has resulted in an equally striking difference in the nature of national development. As long as "Uncle Sam" had a farm for every citizen who desired it, men would not work as hired laborers unless they received something of the same freedom, independence, and income that might be obtained from the farm. Consequently the independent and resourceful farmer set the standards for the equally independent and resourceful laborer. Thus the average American farmer and laborer secured a greater measure of independence and economic well-being than has been attained by the average citizen of any country south of the Rio Grande or perhaps of any other country in the world. These farmers and laborers constitute the majority of the honored "middle class" that we like to boast of as being the backbone of the United States.

PRESENT STATUS OF THE UNITED STATES

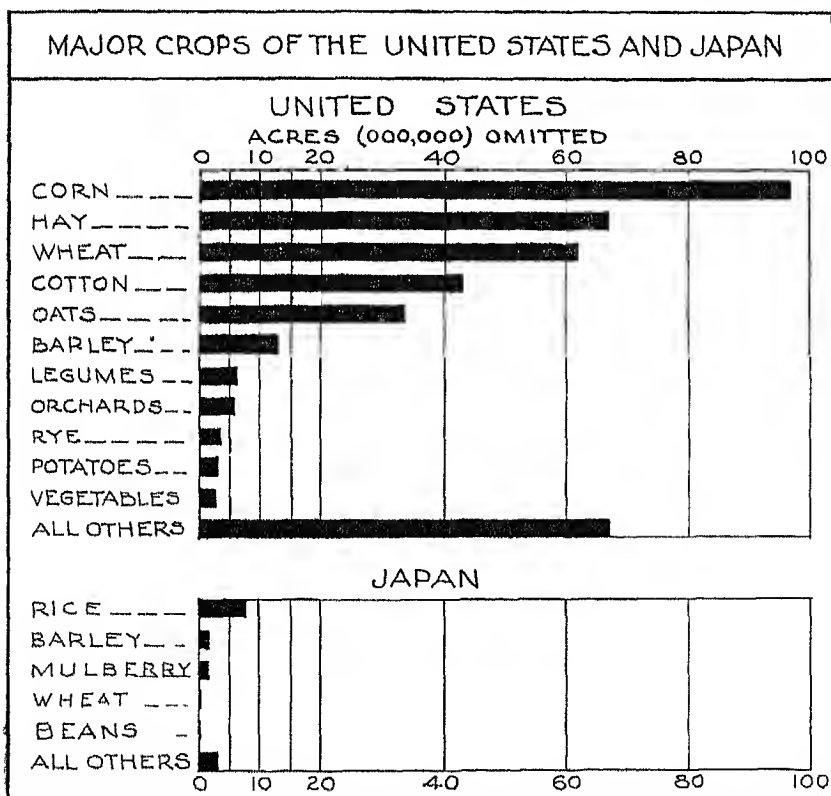
A great power. The United States possesses all the requirements for the development of a great nation. In fact, as normally measured, it has already attained the position of the greatest nation in the world. It is occupied by capable peoples, has an invigorating climate, and possesses an abundance of raw materials. The United States is the largest of the Great Powers of the world, with the exception of Great Britain. In size it compares favorably with China, India, Brazil, Australia, and the Soviet Union. The United States is a populous country, being exceeded in this respect by but three countries—China, India, and the Soviet Union. It surpasses any other country in the variety of its industries and the variety and vastness of its resources.

Linguistic unity. During the Late Colonial period of our development, England dominated the affairs of practically all parts of the New World north of the Rio Grande. As a result English became the common language and has remained so to the present time. This use of a common language has been of great commercial and indus-

trial value to the United States, and has been a factor in cementing the friendship which exists between the United States and Canada. This linguistic unity is in sharp contrast to the numerous tongues spoken in Europe, Asia, Latin America, and Africa.

Land is our most valuable asset. Land is the most valuable asset of every nation, and agriculture is man's basic and most important industry. Soil provides for man's most fundamental needs. It is directly or indirectly the source of all our food and clothing and is a major factor in supplying our shelter. The American people are fortunate in having an abundance of fertile and productive soil.

An abundance of farm land. We do not need more agricultural land. At the present time the United States Government is buying

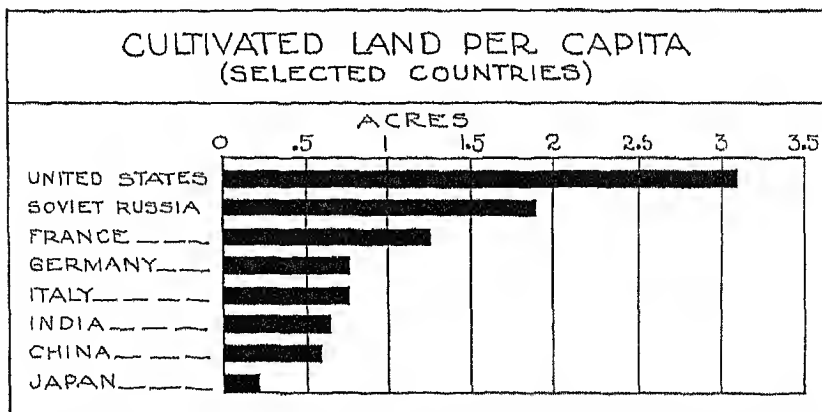


Japan, with a population that is more than one-half that of the United States, possesses less good farm land than is cultivated in the state of Iowa. Yet, Japan uses her land with such efficiency that she is almost self-sustaining in agricultural products.

millions of acres of farm land with the intention of taking them out of crop production and returning them to forest and pasture. By intensively cultivating the fertile and relatively well-watered parts of the United States, we could normally produce enough food to supply twice our present population if it were necessary.

The fact that we are blessed with an abundance of farm land and with climates suited to the production of a great variety of farm products is strikingly illustrated when we compare our soil resources with those of other countries where the population pressure is really great. For example, the mainland of Japan with its 65,000,000 people has but 15,000,000 acres of farm land or less than one-fourth acre per capita. Approximately 50 per cent of this area is given to rice. It should be stated here, however, that much of this rice land is given to other crops after the rice is harvested. Nevertheless, the fact remains that more than one-half of the farm land of Japan is classified as rice land.

Compare these conditions with those of the United States with its population of 132,000,000 and approximately 415,000,000 acres of farm land, or with 14 times as much per capita as is farmed in Japan. In addition, we possess approximately 465,000,000 acres of pasture land, whereas Japan has very little good pasture land. Our abundance of agricultural land and the variety of our crop production, as contrasted with Japan's poverty of agricultural land and her monotony of agricultural products are strikingly illustrated on page



This diagram helps to explain why a large part of the world is in a state of unrest, and why many countries are attempting to gain colonial possessions in the sparsely populated portions of the world.

75. Our abundance of agricultural land is indicated by comparing the acreage of cultivated land per capita in the United States with that of other countries (Illus, p 76.)

Leading agricultural country. The value of agricultural products of the United States normally exceeds that of any other nation in the world. This distinctive position has been attained in spite of the fact that our population is only one-third that of China, less than one-half that of India, and less than that of Russia. The United States is also the leading exporter of agricultural products. In fact, for a time after the World War the value of our agricultural exports exceeded that of all other countries combined. Our great industrial crop—cotton—was an important factor in placing the United States in this preeminent position.

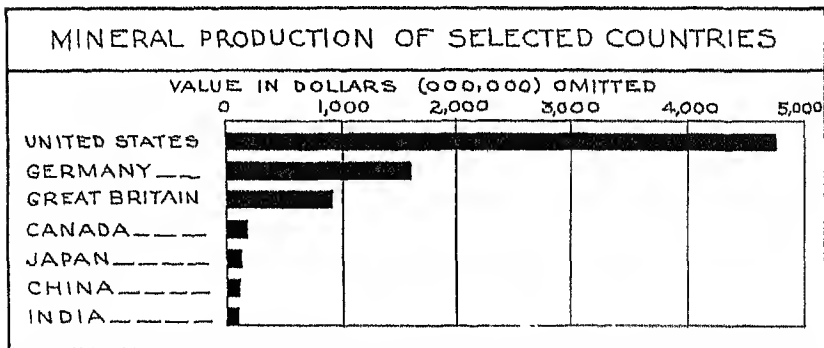
Of the world's aggregate crop production for the five years, 1929-1933 inclusive, the United States produced 51 per cent of the corn, 57 per cent of the cotton, 32 per cent of the tobacco, 24 per cent of the oats, 22 per cent of the wheat, and 15 per cent of the barley. Taking cereals alone, it produced approximately one-fourth of the world's total crops.

Variety of agricultural products. The United States is the only one of the leading industrial nations that is of almost continental dimensions. Our country embraces 3,000,000 square miles of land and has a great variety of climates. Except for some of the tropical products, the United States could supply its own needs of foods and industrial crops. We are able to grow excellent crops of all kinds of fruits except some of the less hardy varieties of tropical products, such as bananas and pineapples. All kinds of cereals, from the warmth-requiring and moisture-loving rice to the drought-resisting millet and the quick-maturing barley, do well in the United States. The combined value of our industrial crops—cotton, flax, and hemp—exceed the value of industrial crops in any other country. We are important producers of sugar beets, dairy products, meats, and a great variety of vegetables. The United States could produce all of its food and have a well-balanced diet without importing a pound of agricultural products from other lands. We would have to do without coffee, cacao, bananas, and other strictly tropical products, and we would be compelled to produce certain products such as sugar and tea at a greater cost than is necessary for their importation. We could produce all of our clothing and be well dressed. We could have excellent homes without importing a pound of raw materials.

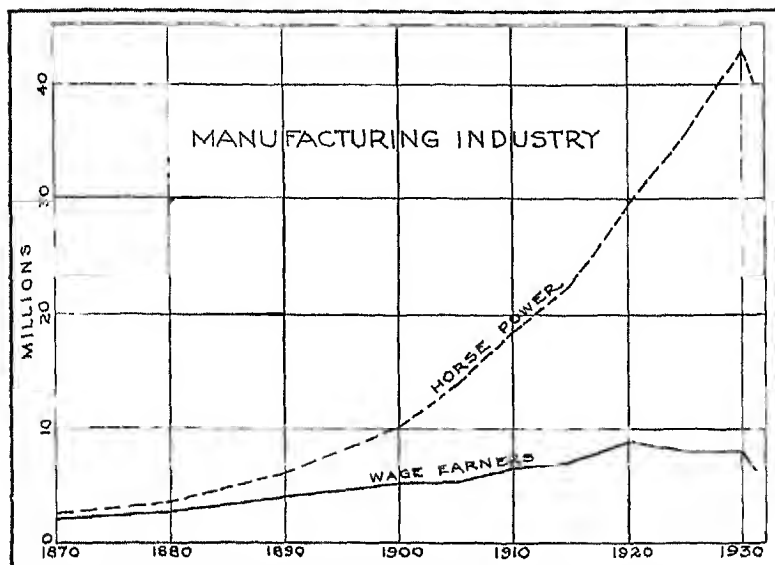
Thus all of the necessities of life could be produced within our own borders. It will be indicated, however, in a later chapter that even the United States with its rich variety of products could not maintain its present high standards of living without importing many raw materials from other parts of the world.

Invigorating climate. In evaluating the opportunities of a people, few factors are more important than climate. The accomplishments of a man are largely dependent upon the energy with which he works. As has already been pointed out, climate is an important factor in determining the degree of health and vigor of any people. Fortunately, parts of the United States lie in the most invigorating type of climate in the world, and all of the populous portions of the country are very good in this respect.

Mineral resources. A resourceful and capable people, suitable soil resources, and invigorating climatic conditions are exceedingly important in promoting the prosperity of any country. Next in importance are the nature and amount of the mineral supply. In this respect we find once again that the United States is the most favored of all nations. This great Republic is, as we shall see, not only in possession of the greatest and most diverse mineral resources of any nation, but is also the greatest mineral producing country in the world. The United States contains less than 7 per cent of the population of the world, but it normally produces more than 35 per cent of the total mineral output. In addition, American capital controls the output of large quantities of minerals in foreign countries. Our mineral output is usually more than three times as valuable as that of our nearest competitor, Germany. It is 30 to 40 times that of either



This diagram illustrates in a striking manner one of the major causes for the great power, wealth, and prosperity of the American people. Figures for 1936

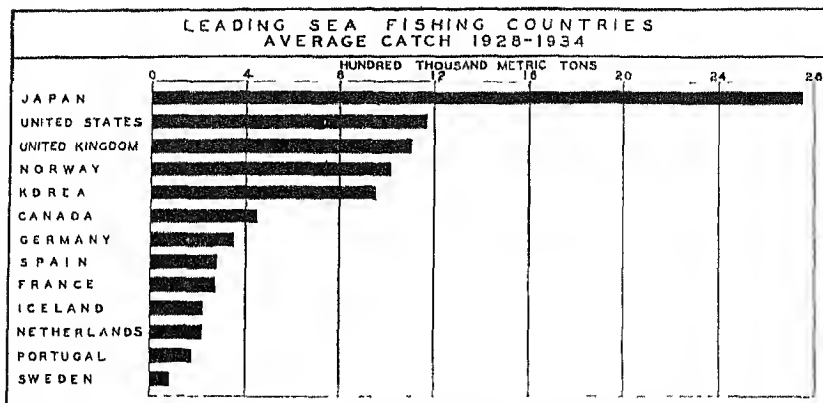


The manufacturing industries of the United States are highly mechanized. Since 1870, the use of mechanical power has increased almost twenty-fold, whereas the number of laborers employed has increased but little more than three-fold.

China or India, both of which are large and densely populated countries. These are facts about which the American people cannot afford to boast since nature has supplied this country with an abundance of natural resources, and has blessed the land with an invigorating climate which stimulates man and makes it easy for him to put forth great energy.

Manufacturing. The United States holds first place in manufacturing just as in agriculture and mining. Not only do we lead in the number of laborers engaged in manufacturing plants, but we also rank first in the value of machinery and in the amount of mechanical power used in the factory. No other country in the world uses so much mechanical power per laborer.

Lumbering and fishing. No other country in the world ever had such a fine stand of saw timber, both hardwood and softwood, as originally existed in the United States. These original immense resources have been greatly depleted, partly because vast areas have been cleared for agricultural purposes and partly because of our large demands for lumber, firewood, and pulpwood. For decades we have been the leading producer, consumer, and exporter of forest prod-



The United States is the leading fishing nation of the Western World Japan, with her dense population and poor agricultural resources, has been forced to turn to the sea for a large part of her food supply. Fortunately she is situated close to one of the finest fishing grounds in the world.

ucts in the world. We still have large resources of high-grade timber. In fact, the finest saw timber forests of the world today are found along the western coast of the United States and Canada. Trees 200 to 300 feet high, straight, and from 3 to 6 feet or more in diameter make fine stands of timber that cover large sections of the West. Our forest resources are by no means inexhaustible, but up to the present time we have felt no acute shortage except for pulpwood. Fortunately, we have been able to obtain large quantities of this product, either in the form of wood pulp or paper, from our neighbor, Canada.

The United States (including Alaska) ranks second only to Japan in the value of its annual catch of fish. (Chart above.) The Grand Banks of the east coast of Newfoundland—one of the three greatest fishing grounds in the world—is well situated for New England fishermen; our salmon fisheries of Washington, Oregon, and Alaska are the finest of their kind in the world; and our rivers and lakes are of importance for fishing, both for pleasure and profit.

Recognition of opportunity. The fact that the United States is a land of opportunity has not been overlooked by the progressive peoples of the world. The early colonists sent alluring reports to Europe of the opportunities that awaited the immigrants to the United States. Gradually the information concerning this land of abundance spread to the crowded countries of Europe and Asia. Among the advantages listed at various times were: (1) excellence of

fishing grounds, (2) an abundance of wild game and furs, (3) fertile and productive soils, (4) invigorating, healthful, and productive climates, (5) political, economic, and religious freedom, (6) opportunity for social equality, (7) ease of securing land; and (8) an abundance of mineral resources associated with opportunity for industrial development.

Such advantages could not be disregarded by the overpopulated portions of the Old World. As a result millions of Europeans sought to gain access to this bountiful land. It has been estimated that during the century, 1810—1910, as many Europeans emigrated to the United States as to all other countries of the world combined. During the latter part of last century large numbers of Asiatics began to arrive at our doors. Finally the flood of immigrants became so large that, in self defense, we were compelled to limit the numbers who could enter.

No other country has ever afforded such opportunities to immigrants as those offered by the United States during the last century. Nor will such advantages for new settlers ever be experienced again. The land frontier is gone. "Uncle Sam" can no longer give a farm to every citizen who desires it. Our door is closed to Asiatic peoples, and the number of Europeans who may enter each year is small.

Nevertheless, it will be clearly indicated in succeeding chapters that the United States still affords unlimited opportunities to her own people. In spite of our extravagance and waste, our resources are still vast. They are sufficiently large to permit our people to develop and maintain a degree of prosperity never before experienced by any people. If all of the laborers of the United States could go back to work, producing by the most efficient methods known to science today, they could quickly effect a degree of prosperity greater than any that has ever been experienced. They would be required to work only a reasonable number of hours each day in order to supply all of the needs, comforts, and conveniences, and many of the luxuries desired by the masses of the people. The laborer would still have an abundance of time for the development of the cultural and spiritual phases of life. Whether or not we realize these accomplishments depends upon the ability of society to adjust itself to the opportunities which this richly endowed Republic affords. Proper human adjustments would mean greater production, more equitable distribution, and greater consumption of goods for the masses of our people.

QUESTIONS AND EXERCISES

- 1 How did the United States' homestead laws aid in the creation of a great nation?
- 2 List as many factors as you can that have contributed in making the United States a powerful nation
- 3 Compare the amount of farm land which we possess per capita with that of any European or Asiatic country (Use Statesman's Yearbook or any other good yearbook) Do you think the average American farmer would be prosperous if he possessed only four or five acres of land?
- 4 Which country can grow a larger variety of crops, the United States or Japan? Why?
- 5 Can the United States grow all of the agricultural products that we need?
- 6 Would American standards of living be seriously lowered if the importation of agricultural products were forbidden?
- 7 List as many ways as you can in which the United States affords greater opportunity for progress than is afforded by other nations
- 8 List as many natural factors as you can that tend to retard progress in the United States
- 9 Are the opportunities for economic success as great today as they were 60 years ago? Give reasons for your answer
- 10 How do social conditions influence the agricultural conditions within the United States? (Read Quinn, James A, *Institutions of the Social World*, pp. 122-148)
- 11 How do social conditions influence the industrial development of the United States? (Read Quinn, James A., *Institutions of the Social World*, pp 178-205)

FURTHER READINGS

- Quinn, James A, *Institutions of the Social World*, J B Lippincott Company, 1937. Getting a Living. Pp 150-205
- Smith, J Russell, *North America*, Harcourt, Brace and Company, 1925
The Continent of Opportunity and its Closing Door. Pp 11-32
- Mineral Yearbook*, United States Government Printing Office. Annual.
- Yearbook of Agriculture*, United States Government Printing Office Annual.
- The Mineral Industry*, McGraw-Hill Book Company Annual
- The annuals noted above give recent data which indicate something of the statistical position of the United States among nations.

RECENT TRENDS IN AMERICAN INDUSTRY

INCREASING MECHANIZATION OF INDUSTRY

Mechanical power substituted for human effort. Perhaps the most obvious trend in American industry is the increasing use of machinery to accomplish the work formerly done by the muscular energy of man and beast. This development relieves man of part of the physical burden which he has been carrying, and gives him an increasing amount of time and energy for the improvement of the mind, which in turn results in further improvement in industry.

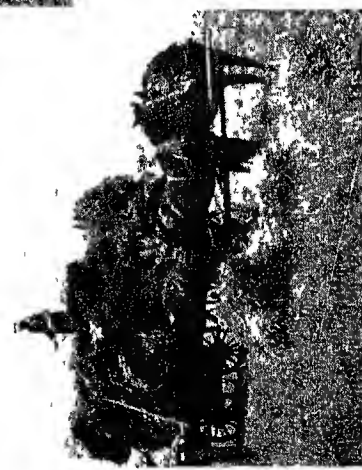
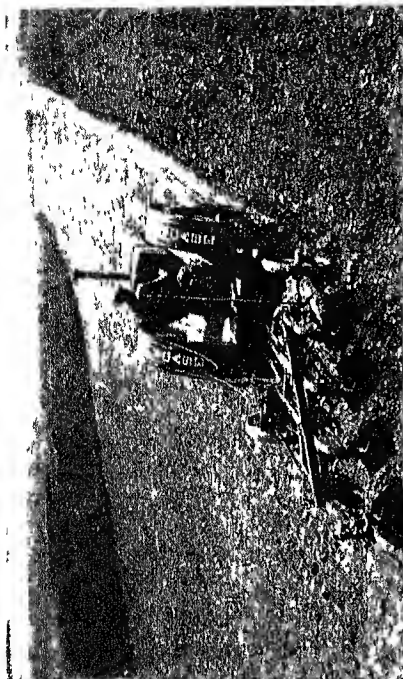
Man's desire for goods seems to be insatiable, but his ability to produce these goods by means of human energy is exceedingly limited. Fortunately, man no longer depends upon his own brute strength to perform his work. He has the ability to think and reason. By use of these functions of the brain he is able, in large measure, to substitute mechanical power for human energy. As a result, mere muscular energy has become a cheap commodity which competes with inexpensive machinery. However, in the fields of skill and science—that is, in the occupations where intelligence is required—man is more liberally rewarded for his efforts. Mechanical slaves can be made to do most kinds of physical labor, but man is unable to devise machinery that can think. Consequently, all types of work that require reasoning must forever be done by man. Thus, the most important trend in American industry is mechanization that lightens the physical burdens of man, thereby giving him more time and energy for mental development.

Mechanization of agriculture. On the farm the tractor is largely replacing the horse; the hay-loader is replacing the lowly pitchfork which for centuries has been operated by human energy; and the washing machine, milking machine, and a score of other power driven mechanical devices are being substituted for human energy. The farmer's wife is obtaining mechanical aid in the home. Already several hundred electrical devices have been invented for use about the house. The great difficulty at present is that millions of our farm homes are not yet supplied with electricity.

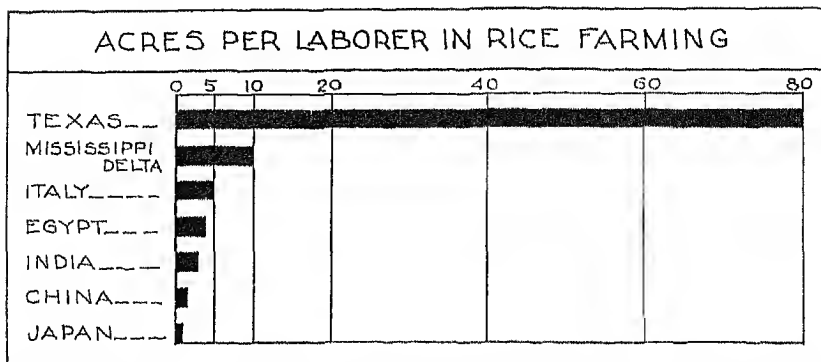
In 1820, it took 83.1 per cent of all workers of the nation to operate the farms. In 1900, after the steel plow, binder, and other animal-drawn machinery had been invented, it required only 35.5 per cent of the workers to operate the farm. In 1930, due to further mechanization of the farm, and the replacement of the horse by motor power, only 21.5 per cent of the workers were needed on the farm. It is probable that today 15 to 18 per cent of the laborers can do all of our farm work. This decrease in the percentage of laborers needed on the farm has released millions of workers for the factories of our country. If 83.1 per cent of our laborers were now needed on the farm, most of our factories would have to close down because of a shortage of help. In fact, if we did away with our modern machinery, all of our people could not do the work now done on the farm. It would require 37,000,000 people, working eight hours a day for 300 days each year to separate by hand the seed from the cotton lint. Similarly it would require millions of men working throughout the year to thresh our wheat crop by methods formerly used and still used in certain backward countries.

No agricultural section of the United States is without its machinery. However, certain types of farming lend themselves to mechanization much better than others. The importance of machinery to the American farmer may be illustrated by the rice industry. In certain sections of the United States the rice farmer digs his irrigation ditches with the aid of massive steam shovels, his land is plowed and prepared for sowing by the use of the tractor, and the rice is cut with a binder and threshed by a modern threshing machine.

Compare these methods of rice culture with those of the rice farmer of southern China. The Chinese farmer digs his irrigation ditches and keeps them in repair by human effort. He plants and tends his rice by hand, cuts it with a reaping hook and threshes it with a flail. These differences of agricultural practices in the rice fields of China and the United States have resulted in striking differences in the productive capacity of the farmers of the two countries. Consequently, it is estimated that one American farmer can raise as much rice as can be grown by 10, 20, and in exceptional cases 60 farmers in China. (Illus., p. 86.) Moreover, in the rice fields of the United States the farmer seldom calls upon his wife and young children for aid in the field; whereas in China the women and children must spend a large part of their time laboring beside the men in planting, tending, and harvesting their crops.



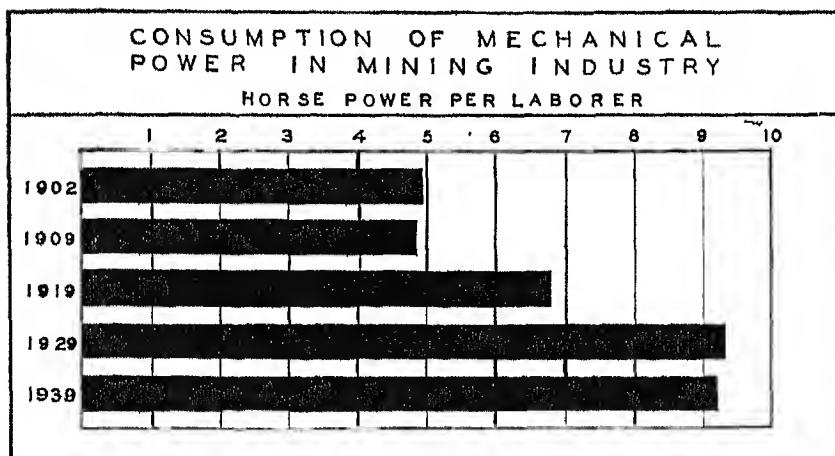
Muscular energy is being replaced by mechanical power Pitching hay or grain on a wagon is hard work (bottom left) By use of the mechanical hay-loader (top left) the task is performed with ease The man with the tractor and gang plow (top right) can do as much work in an hour as the man with the two-horse plow (bottom right) can do in a day (Courtesy J. I. Case Company)



The Texas farmer can tend 50 to 60 times as much land in rice as is cultivated by the average Japanese or Chinese farmer, and, in some cases, produces 60 times as much rice.

The outcome of these differences in the methods of rice culture, is indicated by the fact that an American farmer can produce several times as much of this particular kind of food as he and his family can consume. He accordingly sells the surplus, and with the income thus derived he is enabled to buy a great variety of products; that is, he becomes a commercial farmer. The Chinaman, on the other hand, produces scarcely enough rice to supply the needs of his family. He must, therefore, remain a subsistence farmer. This principle is almost universal. Wherever the farm is highly mechanized (supplied with large quantities of efficient machinery) surplus crops are produced and commercial agriculture is developed; whereas in those parts of the world where farming is still carried on by human effort, the surplus, if any, is usually small per laborer, and subsistence agriculture predominates.

Machinery and mining In the mines, electric cutting machines, power drills, electric and steam shovels, and other power-driven machinery are doing the work previously done by man. Between 1902 and 1934 the amount of mechanical power used by each laborer was almost doubled. (Chart opposite.) For transportation in the coal mine the mule is being replaced by the faster, more powerful, and more efficient electric locomotive. This change is not only profitable but humane. Many a faithful mule has been kept in a dark mine year after year without so much as a glimpse of daylight. While man must still work in mines, his tasks are in most cases less arduous than formerly, and at the same time his productive capacity has increased.



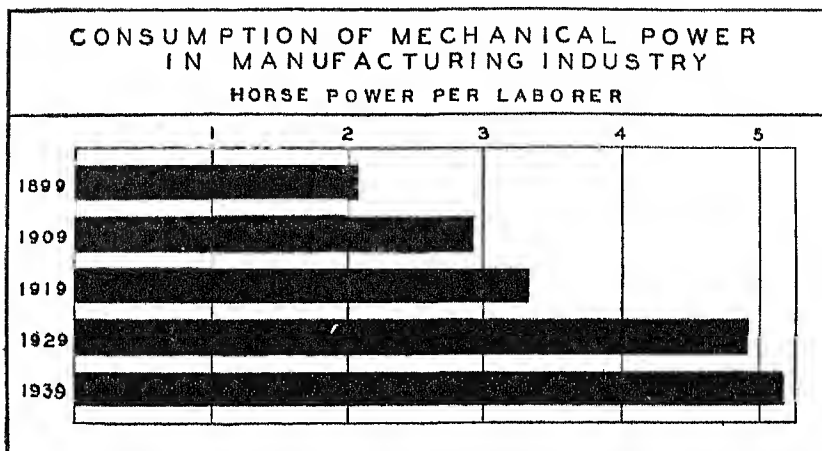
The use of mechanical power per laborer increased almost two-fold between 1902 and 1929. During the depression years of 1930-38, the demand for mechanical power did not increase

enormously. This mechanization of mines has greatly accelerated the exploitation of our mineral resources.

Machinery and manufacturing The great advances made in the mechanization of the farm and mine have been relatively small as compared with those made in manufacturing and transportation. The mechanical power consumed in the manufacturing industries of the United States increased more than fourfold during the first 35 years of this century, while during the same time the use of power per laborer is two and one-half times as great now as at the beginning of the century.

In 1935, the manufacturing industries of the United States utilized, on the average, approximately five horsepower for each laborer employed. It is impossible with any considerable degree of accuracy to translate mechanical energy into terms of human effort. Yet one horsepower of energy is commonly accepted as seven man power of energy. On such a basis our factory system is utilizing more than 35 mechanical slaves for each laborer employed. (Illus , p. 88) In some plants the ratio of mechanical energy to human energy exceeds 100 to one.

Machinery and transportation. During the present century the mechanization of transportation has been more rapid than that of either mining or agriculture. In 1899, the tractive (pulling) power



A horse power is usually considered as the equivalent of seven man power. On this basis our factories are utilizing approximately 35 mechanical slaves for each laborer employed.

of locomotives on our railroads was small. Today it is sufficient to pull 500,000 loaded cars at one time. In 1900, the automobile was a luxury possessed by only a few people. Today it is considered a necessity by the great majority of American families. No other country is so fortunate in this respect. Thus it is in almost every field of industry—machinery is now doing much of the work that was formerly done by man or beast.

Just as the mechanization of the farm has resulted in the production of surplus agricultural products for the individual farmer, so the mechanization of other industries has resulted in surplus of forest, mineral, and manufactured products. At the same time the increasing use of mechanical power for transportation facilitates the exchange of these surplus goods. Thus the New England manufacturers can quickly and economically exchange their surplus shoes, cotton goods, and other merchandise, for the surplus wheat of the Montana and North Dakota farmers.

Mechanical slaves. It has been estimated that the mechanical power which has been developed within the United States is equivalent to 60 to 70 man power for each inhabitant of this country. This is the equivalent of 300 to 350 mechanical slaves for each family. Although as previously stated mechanical power cannot be trans-

lated directly into the human equivalent, these data give some indication of the extent to which the American has substituted mechanical energy for human effort. Moreover, it must be remembered that these mechanical slaves do not work continuously. The family automobile, which is capable of developing a vast amount of power, is only operated a few minutes or hours each day. Nevertheless, the power is there ready to be used when needed.

IMPROVEMENT IN TECHNIQUE

The increasing productivity of the laborer is not merely the result of the increasing use of power. It is also related to the greater efficiency with which this power is used. Thus during the past century the farmer's task of plowing land has been made easier, not merely because mechanical power has replaced the horse, but also because the plow has been improved. More than 500 patents on the plow tell the story of this improvement. The farmer's task of cultivating the land would be an easier one today than it was one hundred years ago, even if the horse rather than the more powerful tractor were still used as the principal motive force.

By the use of modern ball bearings the heavy railway passenger car is pulled, today, with much less power than was formerly required for this task. Similarly, much of the friction that formerly existed between the movable parts of heavy machinery has recently been eliminated, thereby reducing the amount of power necessary to propel such machinery. The cutting edge of machine tools has been improved, so that metals may be cut with greater ease than was formerly the case. This list of improvements in the technique of doing things could be extended indefinitely. It is sufficient to add here that practically all modern machinery has been so efficiently devised, and so carefully constructed, that less power is needed today for the accomplishment of a given task than was required a few decades ago.

INCREASE IN USABLE RESOURCES

Nature of a resource. A resource is something that may be used to supply a need or desire. „Niagara Falls is a resource to a people who can make use of it to supply light, power, scenic beauty, or some

other need or desire. It would not be a resource to a people who find in it merely an obstacle to travel—something to be avoided in a water route. Petroleum that lies thousands of feet below the surface of the earth in Texas is a valuable resource to us, but it was not a resource to the pre-Columbian Indian, who had no use for it and did not, indeed, know of its existence. Similarly, the vast iron ore reserves of the Lake Superior region, now listed among America's greatest resources, were absolutely useless to the Indians who roamed through the neighboring wilderness. Literally hundreds of reserves of the earth's products, formerly worthless, are gradually being classified as resources, as we learn how to make them useful. Thousands of inventions and discoveries are being made every year which transform worthless reserves of some product into valuable resources, or which increase the value of the reserve already listed. A few examples will be sufficient to illustrate the trend.

Aluminum, a new economic product. As an element in the earth's crust, aluminum is much more abundant than iron. Its abundance, however, did not give it economic value until someone discovered how to make it into a product that fulfills some need or desire of man. This did not occur until 1831, when the first metallic aluminum was produced by the ingenious application of chemistry. At that time the cost of production was so high that a pound of the product was almost priceless. It was not a resource to be used by the masses. Twenty years later the metal still cost more than \$200 a pound. Many more discoveries and inventions were necessary before the aluminum of the richer ores (bauxite) could be reduced to a cheap metal. At present the cost of producing aluminum is less than 10 cents a pound—a price that is now within the reach of the masses.

Thus, science has given the world a new resource. Aluminum is strong, tough, malleable, and light. It does not corrode easily and is exceedingly durable when exposed to the weather. These qualities of the metal make it more serviceable for many purposes than any other metal.

Other new resources. Almost innumerable examples might be given to show how science has discovered the key to the utilization of reserves of raw materials and energy which formerly were worthless or of but little value. A few decades ago the world was largely dependent upon the desert of northern Chile for its supply of nitrates, yet 78 per cent of the air at sea level consists of this element. Nitrogen envelops the earth and the supply is unlimited, but it was only

recently that man knew how to reduce this product to a form that could be used in the manufacture of high explosives, commercial fertilizers, and other economic products

This process of unlocking the doors to nature's vast reserves of energy and raw materials is being accelerated each year. Thousands of scientists are trying to discover means of utilizing the energy of the sun's heat, the tides, and the atom. They are trying to discover how to make synthetic foods and to find new and better uses of hundreds of minerals; that is, they are trying to turn useless reserves of energy and raw materials into useful resources, and to find new and better uses for the resources now being developed. Their success during the past 35 years has been phenomenal, so that today man's economic heritage is much greater than it was at the beginning of the century and vastly greater than it was 100 years ago.

SPECIALIZATION IN INDUSTRY

Increasing division of labor. It must be difficult for the present-day high school student to appreciate fully the extent to which occupations have changed during the past century. One hundred years ago the population of the United States was largely made up of an agricultural people. Each family produced on its own land most of the things that it needed. When a new home was required the farmer, with perhaps the aid of his neighbors, built it. Members of the family learned how to spin, weave, make shoes, and do most of the other tasks necessary to clothe the family. Most of the food was grown locally, and only a few luxuries such as sugar, salt, tea, and coffee had to be purchased. Under such conditions the family was a relatively independent economic unit. The entire annual expenditures of thousands of families did not amount to \$100 each. In fact, in many cases \$20 or \$30 would balance the family budget for an entire year. During the past hundred years all of these conditions have been changed.

Today a man's only remunerative occupation may be that of standing in front of a restaurant and crying out to the passer-by, "Meals served at all hours;" or it may be that of parading back and forth in front of a moving picture theater announcing, "Seating immediately on all floors." Men now exchange such services as these for food, clothing, shelter, and all the other necessities and luxuries of life. Such occupations do not require that the laborer have a great

deal of courage, resourcefulness, initiative, inventiveness, or other fine characteristics for which the American pioneers were widely famed and of which they had great need. Today, unfortunately, millions of laborers are required to perform tasks that are of a simple mechanical nature and that require a minimum amount of these fine qualities. This fact in no way discredits the ability of the laborers. They may have many capabilities which their tasks do not permit them to utilize.

Specialization brings increased productivity. There is no denying the fact that specialization has resulted in greater productivity per laborer. A thousand men, each performing a certain limited task in the manufacture of automobiles, can turn out more and better machines, with fewer hours of labor, than would be possible if each one were to try to make an entire automobile by himself. Similarly, the economic advantages of division of labor have been experienced in practically every industry. It is estimated by experts in various fields that between 1899 and 1929, the annual agricultural output per worker increased 50 per cent, the annual mineral output per laborer doubled, while in many of the manufacturing and transportation industries the annual output per laborer has increased several-fold. As a result the average American family is much more abundantly supplied with material things today than it was 100 years ago. Moreover this increased supply is produced with relatively few hours of work. A century ago the average laborer toiled from daylight to dark. Today, eight hours is the normal working day.

Specialization and increasing dependence of laborers. With each increase in specialization comes a corresponding increase in the dependence of the worker. The man who makes his living by working in some highly restricted or specialized field is dependent upon others for almost every necessity and luxury of life. It makes little difference in this respect whether the field be that of the unskilled laborer who tends the door at a hotel, or that of the specialists who teach constitutional history or remove tonsils.

Moreover, under the present system of division of labor, most of the tools of industry are possessed by one group—capitalists; whereas, the work is performed by another group—laborers. Under such conditions the laborers are more or less at the mercy of those who own the machinery. Thus specialization has its disadvantages as well as its advantages. Its application normally results in increased productivity and improved standards of living. At times the pro-

ductive capacity of the nation is thrown out of order, factories and mines are closed down, machines stand idle, millions of men are thrown out of work, and millions of people are poverty-stricken in the midst of plenty. Such conditions prevail during every depression, and they were unusually serious during the depression of 1930-1936. These unfortunate conditions result from the fact that during times of depression society fails to function properly.

TRENDS IN AGRICULTURAL INDUSTRIES

A land of specialization in agriculture. There are few other countries in the world where crops are adjusted to natural environment—climates, topography, and soil conditions—with the same nicety and exactness as within the United States. The extent of this adjustment is clearly indicated by such terms as "Corn Belt," "Cotton Belt," "Spring Wheat Belt," "Winter Wheat Belt," "Burley Tobacco Belt," "Citrus Fruit Regions," and the "East Shore Vegetables District." The vast size of our country and the resultant variation in the natural environment from one region to another have made such adjustments desirable; while our excellent transportation systems, together with the freedom of trade within this great nation, have helped to make such adjustments practicable.

This nice adjustment of crops to environment has been one of gradual development. Seventy years ago each farmer was producing practically all the food required for his family, and each city and village depended largely upon the surrounding farm land for its food supply. All of this slowly but radically changed as transportation was improved. With the development of good shipping facilities and the introduction of low freight rates, the city began to look to distant parts of the United States for a portion of its food supply. The farmer, likewise, began to look to distant parts of the United States or even of the world for markets. He turned more and more to the crops best suited to his land. He gave special emphasis to the growing of one or two crops, such as corn, wheat, cotton, vegetables, citrus fruits, or other fruits or vegetables to which his land was best adapted. He sold the surplus and frequently bought a large part of the food supply for his own family.

This change is well illustrated in such a city as Cincinnati, Ohio, and in the surrounding agricultural area. Fifty years ago Cincinnati secured practically all of its food supply from neighboring

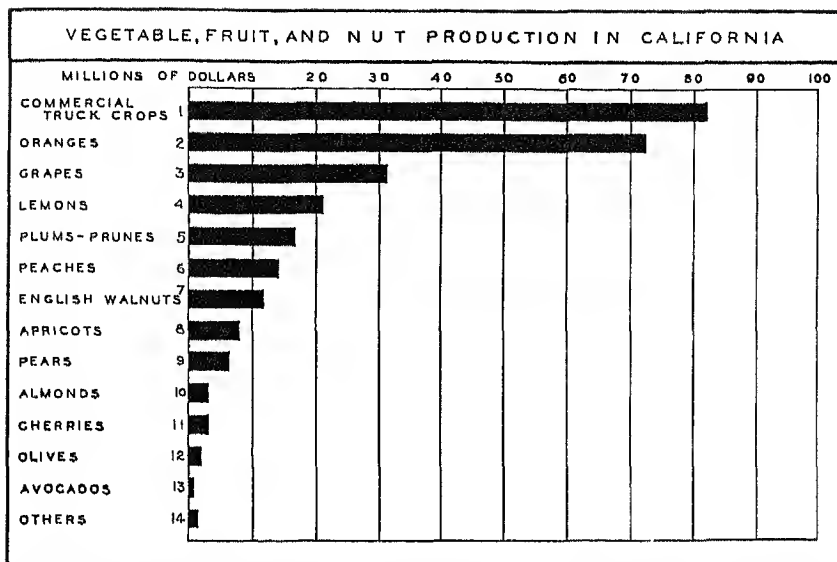
farms, except for such special products as sugar, coffee, tea, and spices. During a recent year Cincinnati imported more than 10,000 carloads of food products from California alone, and thousands of carloads from other states. Of course a great city like Cincinnati will always purchase large quantities of foods from neighboring farms, but it is not dependent upon local farmers.

Adjustment of agriculture to cultural conditions is widespread. The farmers in every part of the United States have had to make adjustments to their cultural environment. In general, the improvement in transportation facilities has permitted each farmer to give an increasing percentage of his land to those crops best suited to the physical conditions (soil, climate, slope, drainage) of his particular area. Thus the farmers of the Corn Belt have given increasing emphasis to the raising of corn and the rearing of animals for meat. The dairy regions are turning more and more to the production of milk, butter, and cheese, and other regions are continuously giving increasing emphasis to the particular crops for which their natural environment is suited.

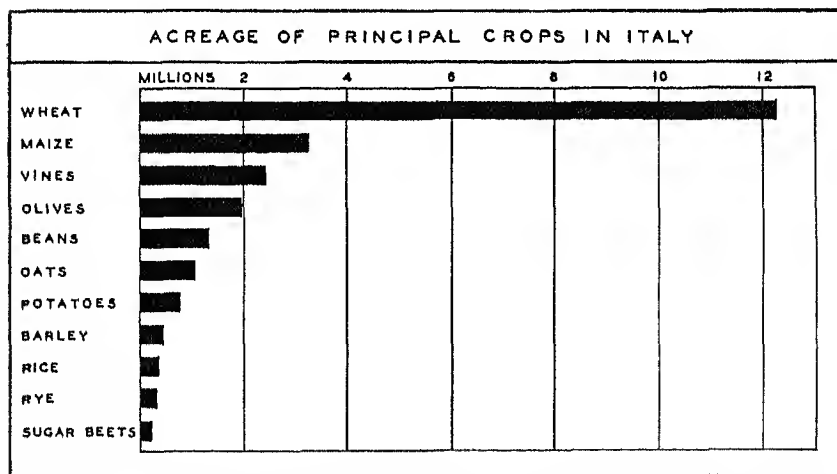
Agriculture must make certain adjustments to cultural conditions in all parts of the world. Space will permit only a few illustrations to be given here. For example, Italy has climates and soils very similar to those of California, and in so far as physical environment is concerned, both regions are suited to the same types of crops. A study, however, reveals that the cropping system of one region differs strikingly from that of the other (Illustrations opposite.) These differences are largely a response to dissimilarities in cultural conditions, as is indicated in the following paragraphs.

Southern California is part of a great nation whose buying power is enormous. California sells her products to every state in the Union, and there is but little danger that the markets of any of these states will ever be closed to her specialty crops. On the other hand California is always able to buy meat from the Corn Belt, cotton from the South, and so forth. This freedom of exchange of goods among the various sections of the United States has been of great service to the farmers in permitting them to adjust their crops to the physical environment of their respective areas.

The cultural setting of Italy is strikingly different from that of California. This sunny Mediterranean land of southern Europe is surrounded by countries that are jealous of one another's power. Consequently, trade between these countries may at any time be cut



California has become the most important fruit- and vegetable-growing state for 130,000,000 Americans



The climate of Italy is much the same as that of the southern half of California, but the cropping systems of the two regions differ strikingly. Figures for 1934 (Compare with the chart for California, above.)

off by high tariffs, sanctions, or war. Italy has no reliable foreign market for such perishable products as iceberg lettuce, cauliflower, string beans, or fresh peaches. She might be able to develop large markets for such products during times of peace, but war would then find her poorly prepared to feed her own people. As a result, Italy has found it desirable to emphasize the growing of subsistence crops, and to give relatively little attention to commercial agriculture. Similarly, Germany, France, and to a lesser extent other European countries emphasize subsistence agriculture or the production of those less perishable staples which have a ready sale in world markets. These types of agriculture are emphasized in order that each country may be as nearly self-sustaining as possible in times of war.

In Asia and Africa the problems are somewhat different. Large parts of these continents are almost as isolated today as California was in 1850. South America contains a region as large as the United States that does not possess a mile of railroad. Most of this area has poor highways or none at all. In parts of Africa transportation facilities are as poor as they are in the undeveloped portions of South America. Consequently in many of these areas man and animals still supply most of the power for transportation. Under such conditions carrying charges are exceedingly high, and the amount of long-distance trade must of necessity be small. Agricultural practices are necessarily adjusted to subsistence farming; but subsistence farming scarcely ever permits a good use of the physical environment. An area well suited for the production of wheat may be poorly suited to the cultivation of potatoes, beans, and the variety of crops that a farmer may wish to grow in order to supply the needs of his family. Thus it is seen that in most parts of the world, cultural conditions prevent the farmers from making a nice adjustment of crops to the natural environment; whereas within the United States cultural conditions favor such a development.

Increasing yield of crops per farm laborer. Between 1909 and 1929 the number of laborers on the farms of the United States decreased about 4 per cent; whereas the total agricultural output increased about 35 per cent. The major causes for this increased production per laborer are: (1) the increasing use of machinery; (2) the reduction of the number of horses and mules on the farm; (3) the improvement in animal husbandry; and (4) the better adjustment of crops to climates and soils. It is a well-known fact that

the use of the tractor, header and thresher, cotton picking machine, and other modern farm machinery has generally reduced the amount of human effort required for most of the agricultural industries. The substitutions of gasoline for horse and mule feed has released between 30,000,000 and 40,000,000 acres of land formerly needed for the production of feed, so that it may now be used for industrial crops or for food crops. That is, much of the land that was formerly used for the production of corn, oats, hay, pasture, and other crops used to feed horses can now be used to increase the production of pork, beef, milk, mutton, wool, cotton, or other products of direct use to man.

The improvement of animal husbandry has been almost as important as the mechanization of agriculture, in bringing about an increase of food products. Dairy cows have been carefully selected so that from a given amount of feed there is now produced about 20 per cent more dairy products than were obtained 30 years ago. The breeds of hogs on the farm have been improved to such an extent that between 1900 and 1930 the amounts of pork and lard produced from a given quantity of feed were increased about 15 per cent. In like manner breeds of sheep have been improved, so that they are now more efficient in transforming feed into meat and wool than they were 30 years ago.

TRENDS IN MANUFACTURE

It has already been pointed out that the manufacturing industry is turning more and more to the use of mechanical power to replace human effort. Other changes just as striking in character have been the increase in the number of products made and the improvement of the quality of the product. A few decades ago the world's largest rubber manufacturing plants produced but a few score of useful commodities. Now more than 30,000 different articles appear on the sales list of a single rubber company. Sixty years ago the steel plants manufactured only a few grades of iron and steel which were used for the fabrication of a few score products. Today the consumer may choose from literally hundreds of different grades of steel, and the products, wholly or partly made of steel, are numbered by the tens of thousands. Moreover, new products are being turned out every day. This increase in the variety of manufactured goods is matched by improvement in quality. The \$1,000 automobile today

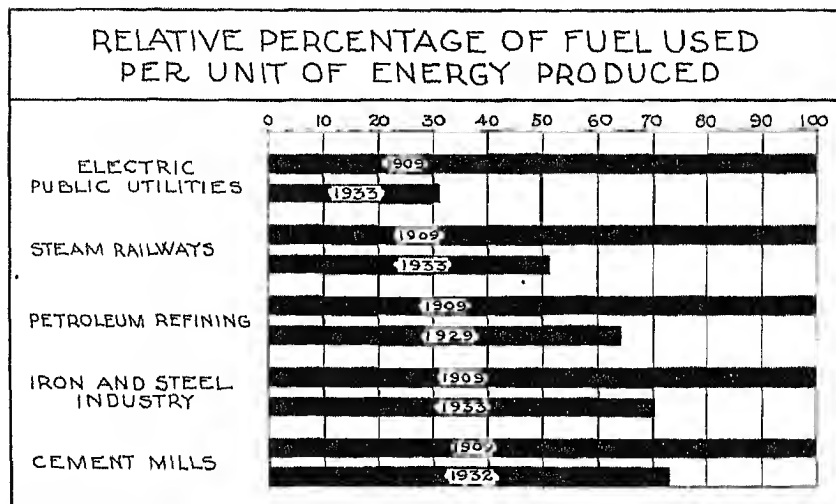
is better than the highest priced car of 1910. Rubber tires, steel rails, and scores of other products wear much better today than they did 35 years ago.

TRENDS IN THE MINING INDUSTRY

Diversity of mineral production. In the development of a new country the precious metals or other mineral products of high value and small bulk are usually the first ones mined. Gold, silver, diamonds, and platinum may be mined in isolated places, provided the ores are rich. These products may be mined profitably even in a region that possesses no modern transportation facilities. Because of their high value and small bulk they can be placed in one's pockets or in a bag and carried to the market. As the population of a new country increased, and as transportation and manufacturing are developed, other minerals are in demand. Today the many manufacturing industries of the United States probably utilize, to a greater or lesser extent, every type of economic mineral produced in any part of the world. New uses for minerals are constantly being discovered. At present, the United States lists more than 100 separate minerals as being produced within this country; and more than a score of others, not mined locally, are being imported.

INCREASED EFFICIENCY IN UTILIZATION OF RAW MATERIALS

The United States, a relatively young nation, has been so richly endowed by nature that until recently we gave but little thought to the conservation of our vast natural resources. About 1900, some of our statesmen began to awaken to the fact that many of our most valuable resources are by no means inexhaustible. These men of broad vision began to plead for conservation of forests, soils, and minerals. About the same time many of our industrial leaders, seeing the danger of depleting the resources upon which their industries depended, began to utilize these resources with greater efficiency. Perhaps the mineral-fuel industries have made the greatest progress in conserving raw materials by applying more efficient methods of utilization. Some power plants now obtain two, three, or even four times as much heat from a ton of coal as was ordinarily obtained 30 years ago.



During the brief span of 20 years, the increased efficiency in the use of mineral fuels has resulted in economies which are saving the equivalent of 200,000,000 to 300,000,000 tons of coal annually

In some plants the coal is now pulverized into fine dust particles before being burned. Thus dust, when blown into a blazing furnace, ignites quickly, almost like a gas, and burns with an intense heat. As a result, the electric public utility plants obtained three times as much energy from a ton of coal in 1932 as in 1909. Other industries quickly fell in step and began to utilize fuels more efficiently (Chart above.)

Corresponding economies have been effected in the consumption of other raw materials. The most modern of our petroleum cracking plants are now capable of obtaining more than twice as much gasoline from a barrel of crude petroleum as was common in 1910. Scientific research in the laboratories of our great rubber companies has resulted in improving the quality of rubber to such an extent that its wearing quality is now twice as great as it was two decades ago.

In the metal industries, the development of alloys (the mixing of metals together in the furnace) has resulted in products that are stronger, lighter, and more resistant to rust and wear than are unalloyed products. These alloys possess qualities that make the products more durable, or that permit the use of small quantities of metals to fill the same need that was formerly filled by larger quantities of

unalloyed metals. For example, it is estimated that the best steel rails of today will stand twice the wear and will last twice as long as the rails in ordinary use in 1900.

NEED FOR RESEARCH IN SOCIAL SCIENCES

During the past century man has made tremendous strides in the development of the natural sciences—physics, chemistry, geology, and biology—and in the application of scientific discoveries and inventions to industry. New resources have been discovered and old ones are now being utilized more completely and to better advantage than formerly. These advances have enabled us to produce more per capita than ever before. Accordingly, by 1928-1929 there was much talk about overproduction of goods. The world had too many automobiles, too much food, too much clothing, to be disposed of profitably. Yet even then there were millions of people who desired automobiles but could not afford them, millions of people who shivered in the cold because they could not buy heavy clothing, and other millions who were undernourished because they could not afford to buy a sufficient supply of wholesome and nourishing food. Three years later, 1932-1933, there was still much talk of overproduction, and steps were taken to destroy cattle, hogs, cotton, and other necessities of life. At the same time 13,000,000 American laborers were out of work, bread lines were being formed all over the country, and millions of people were undernourished in spite of a tremendous amount of national and local relief. These conditions were not the result of a scarcity of raw materials nor of a shortage of productive capacity. They resulted wholly from the fact that our social institutions were not functioning properly. The economic system was unsound. Millions of thinking people were agreed that the social machinery was not functioning as it should; they disagreed, however, as to the best method of repairing it.

Thinking people are still agreed that in a land as rich in resources as the United States all healthy, strong men who are willing to work should be able to make a fair living for themselves and their families. Yet there have been several periods during the past century when granaries were bursting with grain, millions of acres of fertile land were left uncultivated, machinery of production was lying idle, while at the same time millions of idle men could not find profitable employment. No intelligent persons question the fact that under

such conditions society is sick. But where can one find a doctor who can prescribe the proper medicine for these economic ills?

The problem of producing a social organization that works smoothly and for the best interests of all peoples is not as easy of solution as that of building an automobile that runs well. Scientists have invented mechanical devices with which to measure the various parts of automobiles, and with which they can detect imperfections in the size, shape, or strength of any part, but as yet scientists have not been able to measure accurately the imperfections of society. Perhaps social institutions can never be regulated in such a manner that they will always serve the best interests of all peoples. Perhaps the imperfections of society can never be entirely eliminated. Nevertheless, the discovery and understanding of the principles of history, economics, finance, political science, geography, and other social sciences afford the best known bases for the improvement of our present social organization.

During the present century our educational system has emphasized the production phase of science. Our chemists, physicists, civil and electrical engineers have learned how to make a great variety of products in abundance. Moreover, they have learned how to make them quickly and with a constantly decreasing amount of human energy. The great problem before the Western world today is not that of learning how to *produce more abundantly*, but rather that of learning how to *distribute more equitably* and to *use more efficiently*. The solution of this problem lies largely in the social sciences—government, economics, geography, history, and so forth—and to a lesser extent in the natural sciences.

QUESTIONS AND EXERCISES

1. What effect has the mechanization of the farm had upon the American agricultural industry?
2. What effect has the mechanization of the farm had upon manufacturing industries?
3. What factors have to be considered in order to determine whether high-priced American labor can successfully compete with cheap foreign labor?
4. Silk can be produced in China and Japan much more cheaply than in the United States. Why are we unable to compete with China and Japan in sericulture as we do in rice culture?

5. During the depression years of 1932-1934, many people said. "Machines have done more harm than good" What do you think of such a statement?
6. How are you dependent upon other people?
7. Are you more or less dependent upon other people than is the farmer of interior China? Explain your answer
8. How have improvements in the technique of production increased the output per laborer? Give illustrations other than those given in the text.
9. A resource is something useful. Does North America possess any greater supply of natural resources today than it did 400 years ago? Explain.
10. Write a 400-word composition on the subject Advantages and Disadvantages of Specialization in Industry.
11. How do changes in the cultural environment bring about changes in the agriculture of a region? Give examples other than those mentioned in the text
12. What are some of the causes of poverty in a land of plenty?
13. Write a composition on the subject. Some Reasons Why the United States Is a Great and Powerful Nation Study the illustrations in this chapter and on page 68 before writing
14. What have been some of the recent outstanding changes in the uses of our natural wealth? (Read the report of the President's Research Committee on Social Trends, *Recent Social Trends*, pp. 59-121.)
15. How have inventions influenced American production? (Read the report of the President's Research Committee on Social Trends, *Recent Social Trends*, pp 59-121.)

FURTHER READINGS

- Barker, Eugene C, Webb, Walter P, and Dodd, William E, *The Growth of a Nation, The United States of America*, Row, Peterson and Company, 1934. Pp. 544-599
- Report of the President's Research Committee on Social Trends, *Recent Social Trends*, United States Government Printing Press, 1933 Pp 122-166
- Rugg, Harold, *An Introduction to Problems of American Culture*, Ginn and Company, 1931. Pp 171-221.

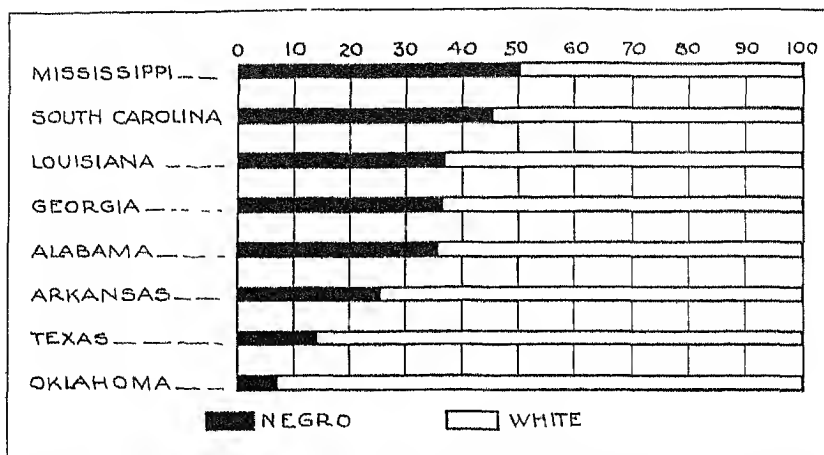


COTTON AND THE COTTON BELT

Importance of cotton. Cotton is the most important of all fibers. It is soft, durable, may be easily woven into cloth, and costs very little. When all of the characteristics of the various fibers are considered, cotton is found to be the one most suitable for the manufacture of inexpensive but good clothing. Accordingly, cotton clothing is worn by all peoples of the world. Approximately a billion people—one-half of the world's population—depend almost exclusively upon cotton for clothing, while most of the clothing for the other billion people is made from this fiber. This world-wide demand for a product grown in restricted areas has caused cotton and cotton goods to hold first place among the products of world trade. Cotton fiber ranks first in value among the raw materials of international trade, and cotton goods hold the same position among the manufactured products.

"Cotton is king." This expression has been repeated so often in the United States that it has become an adage. The statement is not without foundation. For several decades the United States produced more cotton than was grown in all other countries combined, and for many years the fiber has been our most important export. Clothes made of American cotton were shipped to all parts of the world, including darkest Africa, and to the least accessible parts of Asia. A poor American cotton crop results in increased clothing costs for at least a billion people, while a bumper crop of cotton results in cheaper clothing for a comparable number.

Social and political importance. The importance of cotton has not been confined to the economic field. This product has also been a major factor in shaping social and political conditions within the United States. Formerly its production was closely related to the institution of slavery, which has left a lasting imprint on the social fabric of our nation. In each of the Cotton Belt states except Texas and Oklahoma, the Negro now accounts for from one-fourth to slightly more than one-half of the total population. (Illus., p. 104.) The small Negro population of Texas and Oklahoma results from the fact that cotton did not become an important product of these states.



From 25 to 50 per cent of the population of the Cotton Belt states consists of Negroes, except in Texas and Oklahoma. These states did not become important cotton producers until after the War between the States.

until after the abolition of slavery. In 1865 these states were still largely given to pastoral industries, and Negro slaves had not been needed.

Relation to slavery. The introduction and growth of slavery within the United States were largely responses to geographic conditions within the South, and especially within the Cotton Belt. In the early days of its development, the South had an abundance of unused but relatively fertile soil, its climatic conditions were well suited to the production of cotton, tobacco, and rice. The introduction and growth of the Industrial Revolution greatly increased the demand for cotton, and the invention of the cotton gin increased the profits to be made from the cultivation of this fiber. Thus large tracts of unused land, an increasing demand for cotton, and a sparse population, were all factors which worked together to make the institution of slavery a profitable one. Moreover, cotton culture required an abundance of human labor, and the debilitating climate of the South made the white man dread this type of work.

Slavery, then, quickly became an important factor in the agricultural economy of the Cotton Belt. The plantation was the economic unit and the agriculture was developed on a commercial basis. Cotton was grown for sale and not for use on the farm. Such a system of agriculture contrasted sharply with that of the North, where the family was the economic unit, and where subsistence

agriculture was much more important than was the commercial production of crops. Subsistence agriculture did not favor the development of the institution of slavery. Slaves were expensive; consequently, they quickly became an economic burden to their masters unless they could produce something of commercial value. Since the North produced no commercial crop of major importance prior to the War between the States, slavery never became firmly established in that section of the United States. Later, when agriculture in certain sections of the North became highly commercialized, machinery did much of the type of work formerly done by the slaves of the Cotton Belt.

Relation to politics. The political views of the Cotton Belt farmer have differed from those of the industrial North on many questions. Outstanding differences of opinion have, at one time or another, been held on (1) the political status of the Negro—slavery, right to vote, and right to hold office; (2) the question of high protective tariffs; and (3) the problems of internal development.

The opposing views on the status of the Negro was the major cause of the war and later of the bitter struggles over the changes to be made in the Constitution of the United States. The tariff question also created problems difficult of solution. The Cotton Belt farmer sells cotton and buys manufactured goods; consequently he has been opposed to legislation which imposes high import duties on factory-made products, and also to any other legislation intended primarily to increase the cost of manufactured commodities. The laborers of the great industrial centers of the North, on the other hand, desire legislation to increase the price and, accordingly, the profits on the products which they manufacture.

Internal improvements such as the construction of roads, the digging of canals, and the dredging of rivers are intended to aid all who have goods to transport. The Cotton Belt farmer ships, for the most part, products of high value and small bulk. Consequently his desires and needs for internal improvements are not so great as those of the farmer and of the industrialist of the North, who ship tremendous quantities of products that are of low value and large bulk. It is not surprising, then, that the Cotton Belt was not desirous of appropriating large sums of money for the internal improvement of our country.

The foregoing illustrations are only a few of the problems on which the agricultural South has opposed the industrial North. In

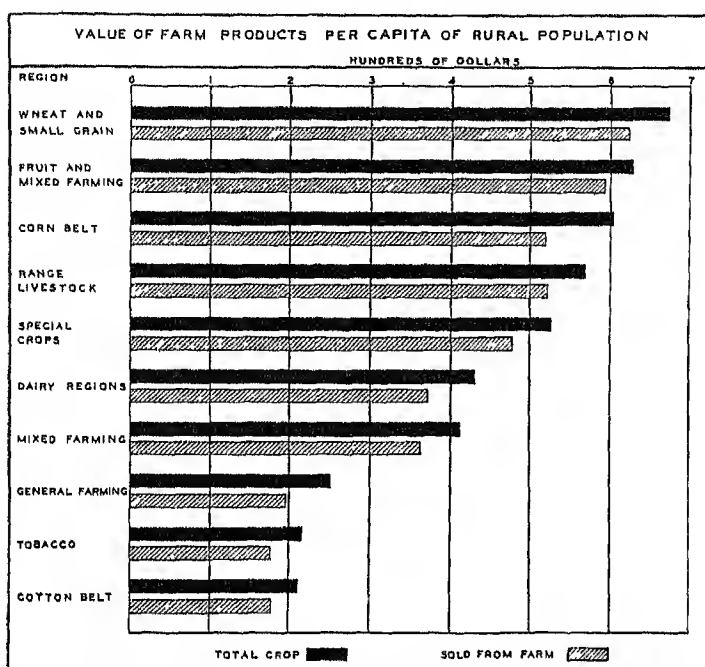
fact, the Cotton Belt states, together with other southern states, have stood together on so many political and economic problems that they have been designated as the "Solid South."

Thus cotton has played an important part in the economic, social, and political structure of our country, thereby earning in the United States the royal title of "king"

Importance to the Cotton Belt farmer. Prior to the war between the North and South the cotton planter prospered. Since the abolition of slavery the Cotton Belt farmer has never been able to achieve the same exalted position among his fellow laborers that his crop has attained among the farm products of this great nation. The Cotton Belt farmer has had an uphill struggle in his efforts to keep in step with the progress made in other agricultural sections of the United States. Many a cotton farmer finds his income so meager that he cannot afford to purchase much more than the bare necessities of life for himself and his family. The average income of the Cotton Belt farmer is less than that of the farmers of most other major agricultural regions of the United States. (Chart opposite.) This low income, in turn, necessitates low economic standards of living. These backward conditions of the Cotton Belt farmer result from problems quite difficult to solve. They are even more difficult than the problems of most other agricultural regions. It will be pointed out later in this chapter that the economic status of the Cotton Belt farmer is closely related to handicaps associated with climate, soil, topography, diseases, insect pests, the racial composition of the population, and the increasing competition of the outside world.

COTTON PRODUCTION

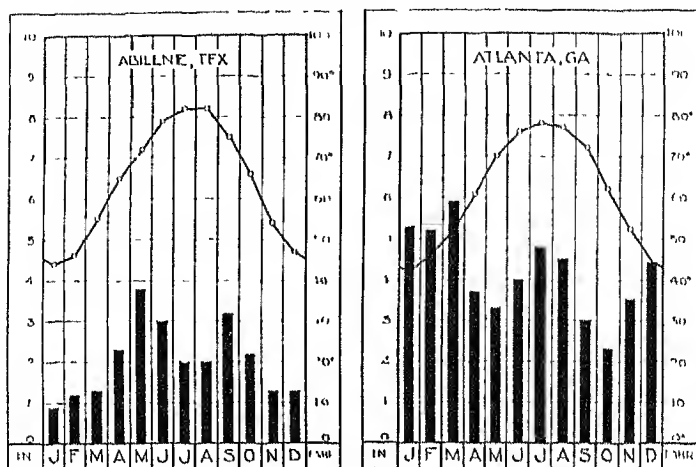
History of the cotton industry. Cotton was used for the manufacture of cloth before the dawn of written history. But prior to 1793, the date of the invention of the cotton gin, cotton was expensive, and clothing made from this fiber was a luxury that very few people could afford. Most of the peoples of the world were then clothed in wool, silk, hides, or some coarse fibers; or, where climatic conditions permitted, millions wore but little clothing. In 1791 the United States produced only 4,000 bales of cotton, and the price of this fiber on the American seaboard was 44 cents a pound. Ten years later, and eight years after the invention of the cotton gin, the South



The Cotton Belt farmer has been faced with difficult problems since the days of the War Between the States. Many of these problems have not yet been solved and as a result the income of the Cotton Belt farmer is less than that of most other farmers of the United States.

produced 100,000 bales of 500 pounds each, and the price had dropped to 16 cents a pound. The manufacturers of clothing were rapidly turning their attention to this cheap but excellent fiber which was soon to become the material for the poor man's clothing the world over. At the same time it began to compete with silk and wool in the manufacture of high-grade clothing. Within a few decades the Cotton Belt was producing millions of bales annually, and the cultivation of cotton was being encouraged in many other parts of the world.

Climate and soil requirements The South is favored by the fact that cotton culture requires rather exacting climatic conditions, and that the Cotton Belt meets these requirements. Cotton needs a frost-free season of approximately 200 days for the production of a fair grade of fiber. Some poor grades of short-staple cotton (fiber less

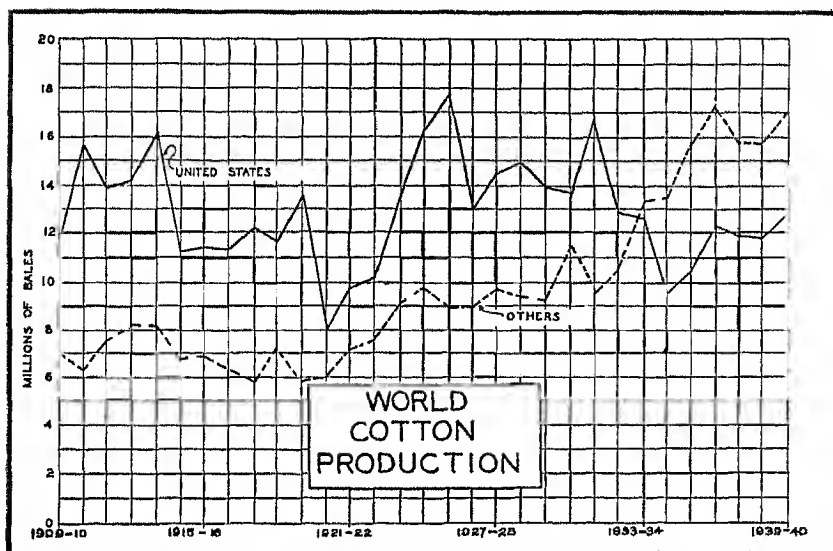


Cotton may be grown where the rainfall exceeds 60 inches a year, provided there is an abundance of sunshine during the ripening season, it may be grown with less than 20 inches a year, provided most of the rain comes during the growing season.

than $1\frac{1}{4}$ inches long) may be grown in regions having a frost-free period of but six months, whereas the best grade of long-staple cotton (cotton with fiber more than $1\frac{1}{4}$ inches long) requires a growing season of seven months or more in order that it may properly mature.

Water for cotton culture may be supplied either by rain or by irrigation. Some of the finest grades of fiber are grown in deserts where water is artificially applied. Most of the world's cotton crop is grown, however, in humid (moist) regions. The ideal moisture supply is provided by a rainfall of 40 to 50 inches. The precipitation should be abundant during the planting and growing seasons—spring and summer—and light and interspersed with an abundance of sunshine during the maturing and picking seasons—fall and winter. Nevertheless, cotton may be profitably grown with 20 inches of rainfall or even less, provided that most of it comes during the growing season; or it may be grown in regions having more than 50 inches of precipitation, provided the maturing and picking seasons have plenty of sunshine. Thus the exact amount of rainfall required depends largely upon the nature of its distribution. The charts at the top of the page show the average rainfall and temperature conditions in both the eastern and the western cotton-growing areas of the Cotton Belt.

The soil requirements for cotton culture are not exacting. Cotton

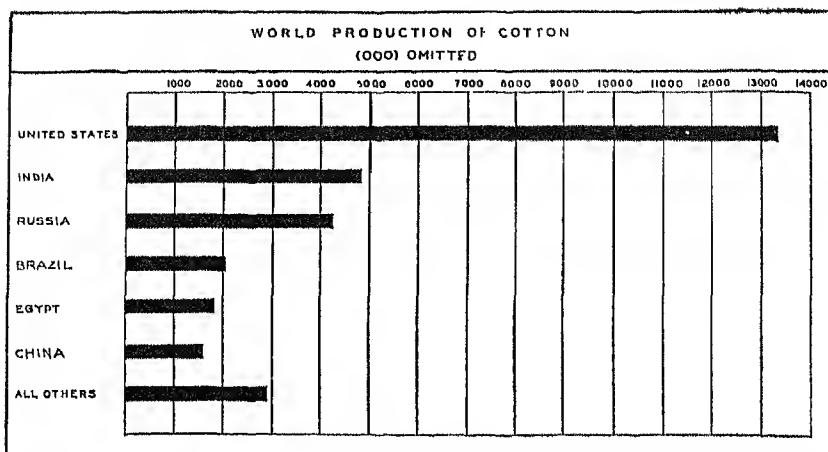


Prior to 1934 the United States produced more than one-half of the world's cotton. However, since that time cotton production in the United States has declined, while it has increased in other cotton-growing areas of the world.

will grow on many types of soil, but it yields best on fertile loams such as those of river flood plains and black prairie land.

Cotton production. Cotton is widely grown within the tropics and the warmer portions of the temperate zones. From 1793 to 1933 the annual production of the United States exceeded that of all other countries combined, but it no longer amounts to more than half of the entire world crop. (See the chart above.)

The output of foreign-grown cotton is likely to continue to increase more rapidly than that of American-grown cotton. Several foreign countries have large areas of excellent cotton land still undeveloped or at present given to other crops. It has been estimated that the acreage of good cotton land of Brazil exceeds that of the United States. Yet, at present the Brazilian output of cotton is very small (Illus., p. 110.) Argentina, Paraguay, Ethiopia, Russia, India, and many other countries are capable of greatly increasing their cotton acreage. The United States, on the other hand, has already extended the boundaries of cotton production into areas where the climate is poorly suited to the crop. It seems probable, therefore, that further expansion of cotton acreage and production is more likely to take place within foreign countries than within the United States.

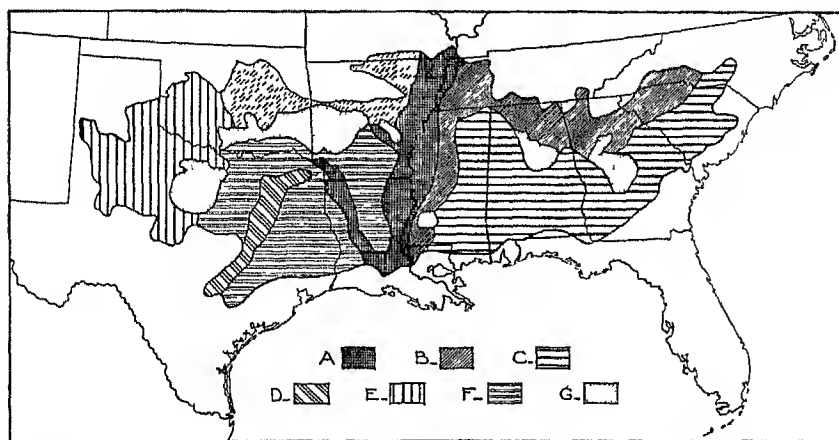


The United States always ranks first in cotton production, and normally it produces nearly one-half of the world's crop. Average annual production for years 1936-37 to 1941-42.

THE UNITED STATES COTTON BELT

Margins of the Cotton Belt. The limits of the Cotton Belt are determined by nature. The northern boundary is marked by a frost-free season of 200 to 210 days. The western boundary is marked by approximately an 18- to 20-inch rainfall zone. Where the average annual rainfall is less than this the yield of fiber is so unreliable and of such poor quality that cotton culture becomes unprofitable. The southern and eastern limits of cotton production are related to unfavorable climate and also to infertile soil and poor drainage. The Atlantic and Gulf Coast areas have too much rain and too little sunshine during the fall and early winter (the cotton maturing and picking season) for the production of a good grade of fiber.

Major cotton producing areas of the United States. The illustration on page 111 shows the United States Cotton Belt. All of the shaded areas are designated as cotton land. However, agricultural and economic conditions differ markedly from one section of this region to another. The proportion of farm acreage in cotton, and the yield per acre vary widely from one area to another, as do also the grades of cotton grown, the sizes of the farm, the scale of operations, and the cultural practices. Most of the laborers in some areas are poor, and, in many cases, they are illiterate tenants whose incomes are distressingly small. In other sections most of the farmers own



United States Cotton Belt Within the heavily shaded areas (A, B, C, D, E, and F) cotton is more important than any other crop

their land and are relatively prosperous. Finally, some parts of the Cotton Belt are owned and operated almost exclusively by white farmers, whereas other parts of the region are farmed largely by Negroes

Although the physical and economic conditions within the Cotton Belt are not similar throughout, the economic conditions are everywhere built around the production and marketing of cotton. Almost one-half of the rural population of the United States lives in the Cotton Belt. Consequently one of the outstanding problems of this country is related to the income and welfare of the cotton farmer. The following is a brief regional treatment of the important cotton-growing areas of the United States.

Flood plains of the Mississippi-Arkansas-Red rivers The flood plains of the Mississippi-Arkansas-Red river valleys (designated as "A" in the map of the Cotton Belt) contain some of the finest cotton land of the entire Cotton Belt. This is a land of wet flats, low ridges, cypress swamps, and canebrakes (a thicket of tall, slender, hollow, woody vegetation). Much of it is called "river bottoms" and has an alluvial soil (sediment laid down by running water) of great depth and enduring fertility. Most of the "first river bottoms" (lower flood plains) are flooded each year unless protected by dykes. Other areas called "second river bottoms" lie above the ordinary flood waters.

Much of the land has been brought under cultivation, and every-

where cotton is the most important crop. In many of the counties 60 to 85 per cent of the cultivated land is given to this useful fiber. In fact, throughout extensive areas cotton is grown to the exclusion of all other crops except corn and the minor crops grown for work animals and home consumption.

Fertile farms and poor people. These flood plains are almost unsurpassed for their fertility, and they produce exceptionally large yields (200 to 270 pounds per acre) of long and strong fiber, yet most of the farmers are poor and backward, and many of them are illiterate. Indeed, very few of them can be properly classified as prosperous. Those who live on the land own very little of it. Absentee landlords (landlords who do not live on the land) possess the land, while the actual labor is performed by Negro and white tenants.

The average tenant farm is between 20 and 30 acres. Since part of the land is used to produce food and feed, and since a share of the cotton crop is given to the landlord, the income of the tenant is small. In 1929, a prosperous year, the average income for each person for the Arkansas-Red river valleys was only \$216 and was surpassed by most other sections of the Cotton Belt.

The area has a large percentage of Negro farmers. Slavery carried the Negro to these lands, and mosquitoes, malaria, typhoid, and floods tended to keep the white people out. Thus in the Arkansas plain Negroes represent 74 per cent of the total population; whereas they constitute but 26 per cent of the population of the state as a whole. The population of two Mississippi counties is more than 90 per cent Negro.

It is an impressive sight during the cotton picking season to see the almost continuous fields of cotton stretching far across the level land. Probably no other equal area in the world provides clothing materials for so many people.

Flood plains and floods. The area designated as "A" in the illustration on page 111 has repeatedly experienced disastrous floods. Moreover, recent developments have made these recurring floods more destructive than they were formerly. Between 1880 and 1915 the railroad mileage of the flooded area was increased nearly twenty-fold; thousands of miles of dykes were constructed; millions of acres of land were brought under cultivation; and thousands of homes were built. The floods of 1912 and 1913 paralyzed transportation within the region and compelled suspension of operation in this portion of



The Mississippi Flood Plain is a fertile land with excellent crops, but the tenant's income is small. (Courtesy Memphis Chamber of Commerce)

four great transcontinental railroad lines The historic flood of 1927 broke the protecting dykes in approximately 200 places, inundated 26,000 square miles of land; flooded the homes of nearly 1,000,000 people; destroyed many million dollars worth of property; and drowned 246 persons It is believed that the rapid development of water-storage basins along the upper tributaries of the Mississippi River will soon reduce or eliminate floods and the devastation caused by them

The Inner Piedmont-Tennessee Valley-Mississippi Region This large area (section "B," illus., p. 111) is second only to the flood plains region in yield per acre (approximately 200 lb), while in total production it comprises the most important cotton-growing section of the entire South This area includes part of the southern Piedmont (foothills of the southern Appalachian Mountains), parts of the Tennessee Valley, and the more fertile soils of Mississippi The topography, size of farms, scale of operation, and cultural practices are very similar throughout this area. On thousands of farms the sloping surface of the land makes erosion a very serious problem, and it is desirable that steps be taken immediately to reduce this type of property destruction. Much of the cotton of this area is grown by croppers under the plantation system of farming In the Cotton Belt a plantation is a large acreage of land owned or controlled by one man but divided into many small farms, each one being cultivated by tenants or hired laborers. Formerly the plantation was cultivated by slaves. Most of the tenant farms are small—30 acres more or less—and almost no large-scale machinery is used. The hoe,

two-horse plow, 10-foot harrow, and one-row cultivator are the major farming tools. Most of the tenants are poor, and many of the homes are little better than shacks.

Old South. Section "C" in the illustration on page 111 is sometimes designated as the "Old South." The northeastern part of this section includes part of the southern Piedmont. Here soil erosion is more severe than in any other part of the Cotton Belt. The remainder of section C is situated on the Coastal Plain, where the soils are light and sandy and relatively infertile. At one time cotton was much more important here than at present. The one-crop system quickly robbed the soil of much of its fertility, and consequently the cotton yield rapidly declined. Moreover, the warm, moist climate was well suited to the ravages of the boll weevil, and in some areas the crop was completely destroyed by this pest. In recent years the production of tobacco, commercial peanuts, and tree crops—especially the pecan—has increased, while that of cotton has decreased.

The Black Waxy Prairie—One of the most important cotton-growing regions of the United States is situated in central Texas (section "D," illus., p. 111) and is known as the Black Waxy Prairie. It is an area of gently rolling land with soil of great natural fertility. The major disadvantage of the region for the promotion of cotton culture is the semiarid nature of the climate. The light rainfall reduces the cotton yield to approximately one-half that of the average for the Mississippi flood plains. The farmers of this area are, nevertheless, relatively prosperous. The farms are large—averaging about 100 acres—and the farmers do not depend wholly on cotton. Corn, small grains, hay, and other feed crops are important, and the livestock industry is promoted on almost every farm.

Western Texas and southern Oklahoma. One of the most interesting and prosperous cotton-growing areas of the United States is that of western Texas and southern Oklahoma. (Section "E," illus., p. 111.) This is the only large-scale cotton-growing region of the world. The average size of the farm is approximately 240 acres. The average farmer tends more than 60 acres of cotton compared with 18 to 20 acres for the Cotton Belt as a whole.

The secret of this large-scale farming lies in the ability of the farmer to use large-scale machinery. Here the cotton farmer uses the gang-plow, multiple-row cultivator, 40-foot harrow, and mechanical cotton-planting and cotton-picking machines. The land is exceedingly level and therefore well suited to the use of large-scale

machinery. However, the nature of the climate rather than the topography is the most important factor in determining the method of cotton culture.

Climate and the cotton-picking machine. Within the humid portions of the Cotton Belt, the cotton must be picked very shortly after the bolls open, otherwise the fiber will be discolored and ruined by the moist atmosphere and the rain. Since the cotton bolls do not all open at the same time, the fields must be picked over repeatedly. No machinery has been devised until recently that will economically pick only the ripe cotton and at the same time leave uninjured the unopened bolls. Thus, to date, no cotton-picking machine has ever been used on a large scale in the humid portions of the Cotton Belt. Almost every year reports are given out that a cotton-picking machine suited to the humid portions of the United States has at last been invented. At present (1938) such a machine is being tested. Reports indicate that the machine operates satisfactorily but as yet it has not been used on a large scale.

In the semiarid lands of western Texas and southern Oklahoma, the cotton-picking machine has proven to be entirely satisfactory. Here, during the cotton-picking season the rainfall is light and the sunshine is abundant. Consequently, the cotton fiber will not be injured even when left in the open boll for a considerable length of time. As a result, it is a common practice to let the first cotton that ripens remain on the stalk until all bolls are ripe. Then all of the cotton is gathered at a single picking. Under such conditions, cotton-picking machines are profitably used.

Since the climate is semiarid, the average acreage yield of cotton is low—about 125 pounds. The acreage yield would be still smaller but for the fact that the soils retain moisture well, thereby partly offsetting the disadvantages of a meager rainfall. Moreover, the low yield is more than offset by the large acreage, which each farmer plants, cultivates, and picks. With an average of more than 60 acres for each farm given to cotton, even the low average yield of 125 pounds per acre is equivalent to 7,625 pounds (15.2 bales) per farmer. This is more than twice the average acreage production for the Cotton Belt as a whole.

Area of diversified agriculture. This section of the Cotton Belt not only stands first in the amount of cotton grown per farmer, but it ranks high in the total production of corn, wheat, hay, and forage crops; it also supports large numbers of horses, cattle, hogs, and

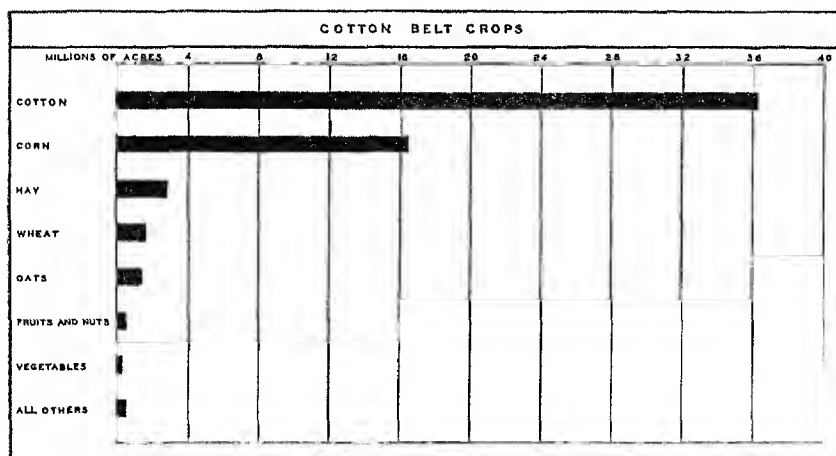
poultry. Most of the farmers own their own land and are prosperous. The many excellent houses, good barns, fine herds of cattle, neat and well-kept farms, and good highways all give the impression of a prosperous people. Moreover, since large-scale machinery is used in doing the work, relatively few women or children are required to do manual labor on the farm. Neither has cheap Negro labor been brought in. In these respects western Texas and southern Oklahoma differ markedly from all other parts of the Cotton Belt.

Other Cotton Belt regions Those areas lying west of the Mississippi River and designated as section "F" in the illustration on page 111 are as a rule relatively infertile, and produce only a medium or poor grade of cotton. Cotton and corn are the principal crops, but the acreage yield of both is considerably below that for the Cotton Belt as a whole. Farming in most of these areas is characterized by small farms, small and irregularly shaped fields, small tools for farm work, poor houses, and poor people.

The minor areas designated as "G" are given largely to fruit, vegetables, and diversified agriculture. Cotton is only secondary in the cropping system. In central Georgia the peach crop is especially valuable. In the areas designated as "G" surrounding Birmingham, Alabama, and Atlanta, Georgia, specialized farming has been developed to care for a large part of the needs of these urban centers. The small area situated in southwestern Mississippi is given largely to the trucking industry. It produces large quantities of winter vegetables used to supply the local urban markets and to ship to the markets of eastern cities. The areas of Texas designated as "G" are given largely to subsistence agriculture or to dairying to supply local markets.

MAJOR PROBLEMS OF THE COTTON BELT FARMER

Problems numerous and difficult. Perhaps no other major agricultural region of the United States presents so many difficult farm problems as those of the Cotton Belt. There is always something for the Cotton Belt farmer to worry about. Cropping systems, weather, soil erosion, insect pests, diseases of both plants and animals, inadequate machinery, labor problems, and competition with cotton growers of other parts of the world. These problems and many others



The Cotton Belt is largely given to cotton and corn

seem to work together to keep the Cotton Belt farmer from attaining the average degree of American prosperity

Cropping system. More than one-half of the cultivated land of the Cotton Belt is continuously given to cotton. About one-half of the remainder is planted in corn. (Chart above.) Much of the land is given to cotton year after year. The one-crop system quickly robs the soil of those fertilizers which are necessary for the growth of cotton. In order to overcome this difficulty, the farmers have been urged to diversify—to grow a variety of crops. However, it has been a difficult problem to find other crops which are suited to the climate and soils and are at the same time profitable. The need for crop diversification will be discussed later in this chapter.

Soil erosion. The soil is the chief asset of the farmer. It is a product which nature always makes very slowly, but one which, unfortunately, nature may destroy very quickly, especially when aided by man. It has been estimated that it requires about 700 years to produce an inch of soil from the underlying rock. It would, accordingly, require several thousand years to produce a soil-covering sufficiently deep for agriculture. Thus, from the human point of view, erosion results in a permanent loss. It is therefore unfortunate for the Cotton Belt farmer that the climate, soils, topography, and cropping system all favor the erosion of his land. Up to the present time the problem has been too difficult for the farmer

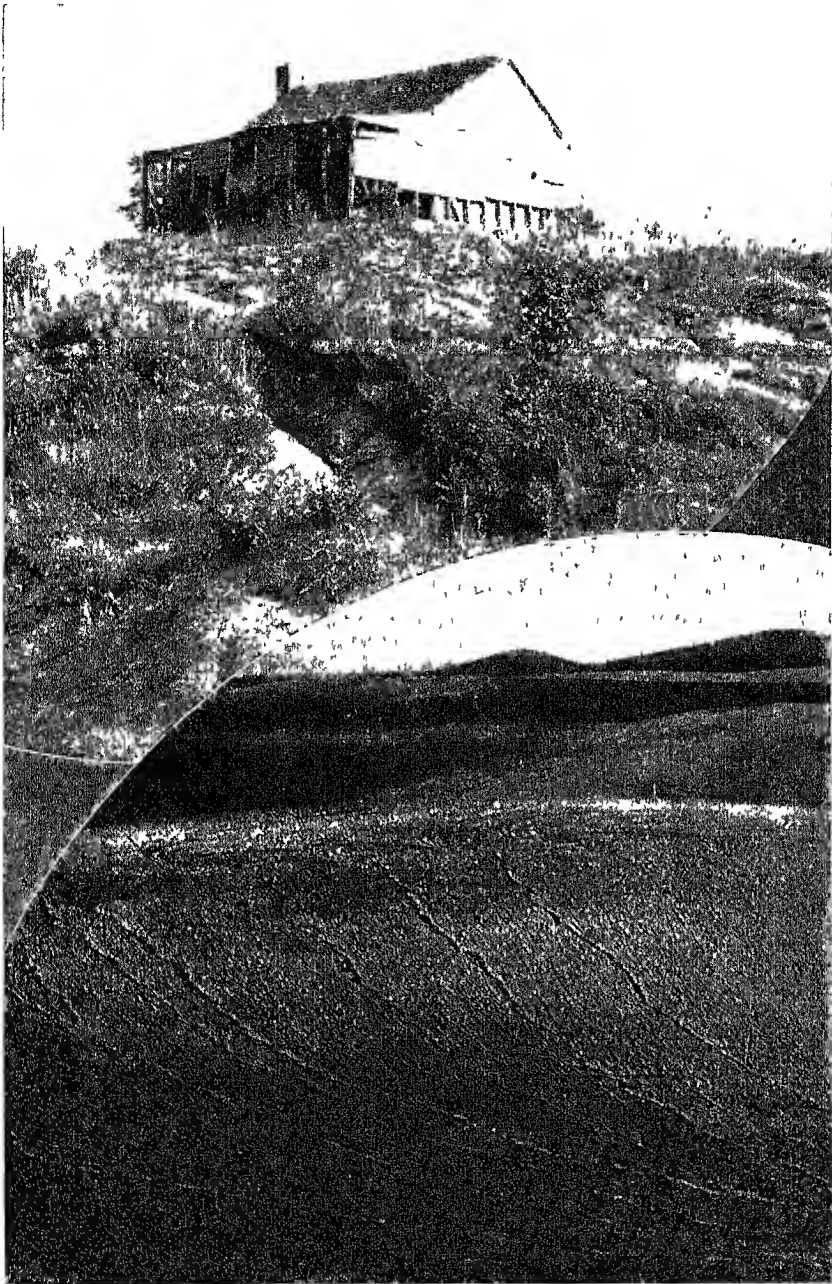
to solve in a satisfactory manner. In fact, it is doubtful if any other large section of the earth has ever been robbed of its soil by erosion so rapidly as the Cotton Belt.

The native forest and the prevention of erosion. So long as the land was left in forest, nature manufactured soil from beneath as fast as it was washed away from the surface. The roots of the vegetation opened many pores and crevices in the soil, so that most of the moisture could soak into the ground instead of running off the surface. The little that did flow off the surface moved slowly because of the underbrush, leaves, sticks, and other debris which prevented rapid movement of the water. Water which moves slowly has but little power of erosion. Consequently, as long as the land retained its native vegetation, the soil was preserved.

Agriculture and erosion. As soon as the land is cleared and used for agricultural purposes the rate of erosion is greatly increased. The trees, leaves, sticks, and other obstructions to rapid run-off are removed from the land, and the plow pushes the soil about and clogs the pores and openings, so that the rains cannot soak rapidly into the ground. Under such conditions the run-off is greatly increased. Since rains come at all seasons in the Cotton Belt, the land gets no rest from erosional waters, most of the land is in slopes sufficiently steep to favor erosion; and most of the soil is composed of fine particles which may be easily carried by running water. The major crops—cotton and corn—require frequent plowing, and the soil is thereby kept constantly in condition for heavy rains to wash it away. The logical consequences have been that the farmers have suffered tremendous losses from erosion.

Within that part of the Cotton Belt which lies east of the Mississippi River, more land has been almost or completely ruined by erosion than is at present given to cotton. Most of the remainder of the cultivated land has been seriously damaged by erosion, so that the yield today is much less than it was formerly. Stealthily but rapidly the flood waters have been carrying away the most valuable natural resource of the South.

Prevention of erosion. Mechanical processes used to retard erosion, such as terraces and contour plowing (plowing around the hill instead of up and down it), have not proved to be very successful methods of stopping this destruction. Much better methods are the growing of certain crops such as alfalfa, grass, and legumes, or the adoption of proper crop-rotation systems. For example, alfalfa has

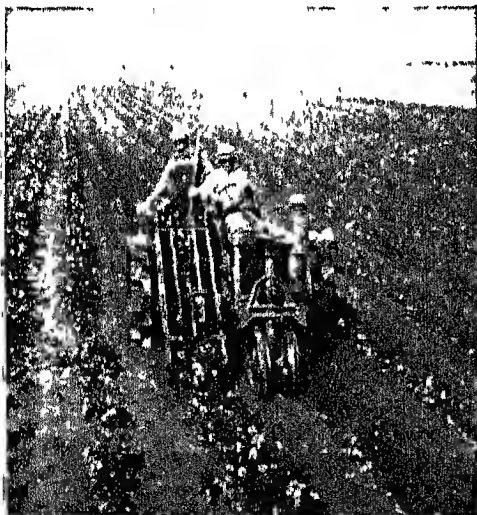


Constant cultivation of land in cotton and corn, combined with the heavy rainfall of the Cotton Belt, makes it difficult for the farmer to retain the soil. (Courtesy Soil Conservation Service, U. S. Dept. of Agriculture)

proven to be 289 times more effective than corn in holding soil on hill slopes. Grass is 190 times more effective than corn, and a four-year rotation of cotton, corn, grass, and pasture, six to eight times as effective as either cotton or corn. The major fault with such systems of cropping is that the crops best suited to the prevention of soil erosion may not prove to be profitable ones in the Cotton Belt.

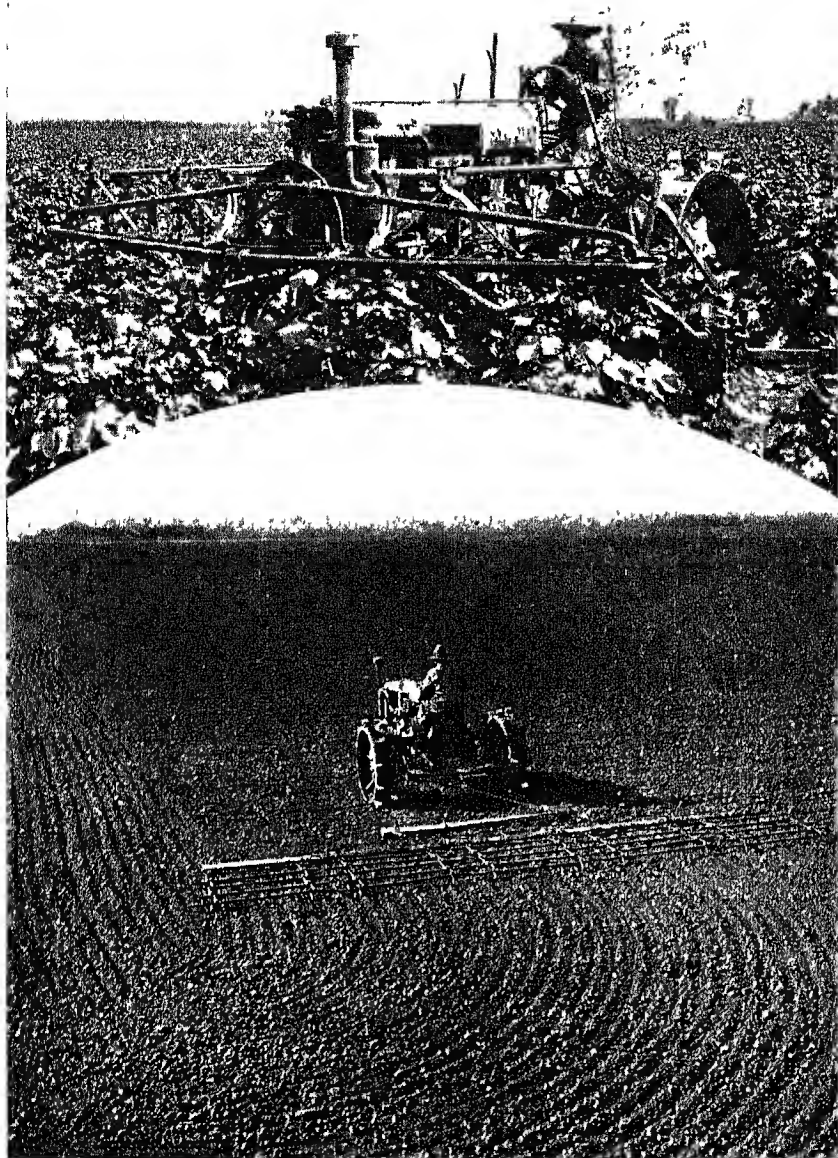
Small use of farm machinery. Except in western Texas and Oklahoma, the Cotton Belt farmer uses but little farm machinery. This fact does not result from the backwardness of the farmer, but from the fact that no cotton-picking machine has yet been invented which may be used profitably in the humid portions of the Cotton Belt. As long as the cotton must be picked by hand, it will scarcely be profitable to use large-scale machinery in preparing the land for seeding and in cultivating the crop. The use of the gang-plow, the 40-foot harrow, and the two-row cultivator to prepare the land and to tend the crop does not fit into the system where women and children pick the crop by hand. The farmer with a two-horse plow, single-row cultivator, and an eight-foot harrow can plant and tend as much cotton as the entire family can pick.

In western Texas and Oklahoma the cotton farmer uses large-scale



With the cotton-picking machine, two men can pick ten times as much cotton as they could pick by hand. (Courtesy Texas Agr. Exp. Station.)

machinery because a cotton-picking machine which will do the work of 10 to 20 laborers has been devised and successfully used. (See photo.) Since one man with a machine can pick a large acreage in a short time, he is encouraged to produce a large acreage. Hence he uses large-scale machinery in plowing the land, preparing it for planting, and cultivating the soil. In the large-scale cotton farming region of Texas the average size of the farm is 241 acres and the average acreage of cotton for each



In western Texas the use of machinery lightens the farmer's burdens and enables him to increase the acreage cultivated and the amount of crop harvested. The tasks of preparing the land for seed, cultivating the cotton, and harvesting the crop are all simplified by the use of machinery. (Courtesy International Harvester Company)

planter is 61 acres, whereas in the Mississippi flood plain, where the cotton is picked by hand, the average farm is 37 acres and the average acreage given to cotton is 16.5 acres. These facts help to account for the more extensive uses of farm machinery in Texas than in Mississippi and the other states of the more humid parts of the Cotton Belt.

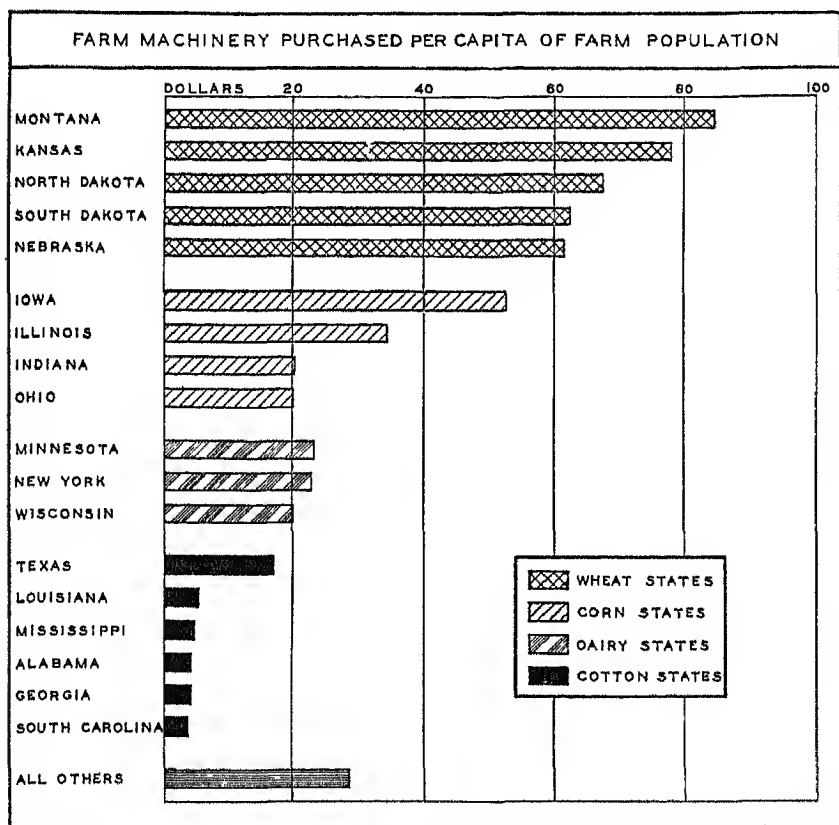
Boll weevil. In 1892 the boll weevil, one of the most destructive pests that ever afflicted the American farmer, entered the Cotton Belt from Mexico. This insect does not thrive in dry climates, and consequently its spread was slow so long as it was confined to the semiarid lands of Texas. As soon, however, as it reached the moist lands of Louisiana (about 1910) it began spreading very rapidly, and within 10 years had reached every county of the entire Cotton Belt.

Years went by after the boll weevil entered the country before either the farmer or the United States Department of Agriculture knew what was destroying the cotton. Then it was discovered that the larvae of the boll weevil eat their way into the unripened bolls of cotton and spoil them. It was also discovered that the climatic conditions suited to the best grades of cotton were also those best suited to the ravages of the insect. Hence the finest grade of cotton grown in the United States—sea-island cotton—was entirely wiped out by this pest. In general, the long-staple cotton regions were afflicted worse than the ones that grew the short-staple and less valuable cotton. The ravages of the boll weevil brought financial ruin to thousands of farmers and threatened to destroy the entire cotton-growing industry of the South. Yet for years the farmers and the United States Department of Agriculture were helpless in preventing this ravage. The average yield of cotton per acre dropped alarmingly, and the total annual output dropped from the customary quantity of approximately 14,000,000 bales to less than 8,000,000 bales. The pest presented a challenge to American scientists that could not be ignored. Consequently, the habits of the insect were studied, and methods of checking its spread were finally discovered.

Other problems of the Cotton Belt. The problems associated with the unsatisfactory cropping systems, the excessive soil erosion, the inability to use large-scale machinery, and the boll weevil are not the only ones that have baffled, at least for a time, the Cotton Belt farmer and American scientists. The institution of slavery created race problems difficult of solution. The warm moist climate and in

places poor drainage are conducive to the spread of insect pests and disease germs which afflict plants, animals, and man. Such human diseases as malaria, hookworm, and typhoid have been difficult to control, the fever tick which spread disease among cattle was a curse to the farmer for several decades; and fruit and cotton diseases and pests have at times resulted in agricultural crises in parts of the South.

Resultant influences on society. The many economic handicaps and the difficult problems that have beset the Cotton Belt farmers have reacted unfavorably upon social conditions within the region. Statistical studies indicate that the income, wealth, education, and health, reduced to a per capita basis, combine to give the Cotton



The Cotton Belt farmer uses relatively little farm machinery as compared with the Wheat Belt farmer. Figures for 1930.

Belt a lower ranking than that of most other parts of the United States

A comparison of the income of the Cotton Belt farmer with that of the farmers of other sections of the United States indicates that the former is near the bottom of the scale. The income of the Cotton Belt farmer is only about 40 per cent of that of the Corn Belt farmer. The houses, electric refrigerators, automobiles, furniture, and farm machinery owned by the Cotton Belt farmer are, on the average, less valuable than those owned by the farmers of most other sections of the country (Illus., p 123). These facts indicate that the rural population of the Cotton Belt is below the normal for the United States as a whole in the possession of the conveniences, comforts, and luxuries of life.

OUTLOOK OF THE COTTON BELT FARMER

The agricultural possibilities of the Cotton Belt are astonishingly large. The region has a long growing season, adequate rainfall, and soils that can be made productive if properly cared for. The region has fair to good transportation facilities, is located close to large markets, and contains land that is still relatively cheap. These advantages have not been adequately utilized. The one-crop system, soil erosion, small acreage per farm, absentee landlords, tenancy, racial problems, shortage of local food crops, backward state of animal industries, poor homes, and unattractive rural environment have all worked together to retard progress in large parts of the Cotton Belt.

Much scientific research is needed to develop properly the agricultural resources of the region. Erosion must be reduced in order to save the soil that still remains. Steps for such conservation are now being taken by reforestation; by seeding the land to grass or other cover crops, by scientific crop rotation; and by mechanical means such as contour plowing and terracing. These steps for soil conservation should be pushed forward rapidly.

Need for diversified agriculture. Greater diversity of agriculture is one of the most urgent needs of the region. The cotton planter is likely to find the competition of the foreign cotton producer constantly increasing year by year. Many countries, especially Brazil, Argentina, Uganda, Ethiopia, British Sudan, and southwest Russia, have millions of acres of fertile land with climates well suited to



Peanut field, Tidewater, Virginia The peanuts are shocked to dry before threshing

cotton, and with a large supply of cheap labor adapted to its production. Consequently, immediate steps should be taken to make the American farmer less dependent than at present upon this fiber crop. Every effort should be made to discover other profitable crops suited to the region (Illus, above) This process could be hastened by large-scale experimentation with the great variety of crops known to be suited to such climates

Need for promoting animal industry. In many sections of the South slight attention is given to animal industries. Some sections do not produce enough dairy products and meat for local needs. These conditions are in part related to the historic development of the region and in part to geographic factors which have handicapped the South in the development of livestock industries

The plantation of the days before the War between the States was not well fitted for livestock rearing. It was primarily an industrial organization adapted to the use of slave labor for the production of a cash crop—cotton. The care of blooded stock, and especially of dairy cows, is admittedly a task for experts, and the slaves were not trained in this field. The poor whites expended even less energy than the planters in improving the quality of their animals. Some animals, such as the mule, long-horn cattle, and razorback hog, were able to survive in spite of poor care. It is true that a few planters gave special attention to fine breeds of horses, cattle, sheep, and hogs. For the most part, however, these animals were not a matter of major importance. It is not surprising, then, that the livestock industry of the South was backward at the time of the outbreak of the war.

At the close of the war the livestock industry of the Cotton Belt was prostrate. Millions of horses, cattle, sheep, and hogs had been

sacrificed for the needs of the warring armies or were seized by foragers. Since then the development of the livestock industry has been retarded by (1) the need for good feed crops, and (2) the need for control of livestock diseases.

Need for good feed crops. One of the major handicaps of the animal industry of the Cotton Belt is the lack of feed crops well suited to the soils and climate of the region. There are only six states in the Union with less than 10 per cent of their cultivated land given to hay and feed crops. They are all located in the South. Even where land in the South is given to these crops the acreage yield is generally small. Consequently, one of the greatest needs of the Cotton Belt is to discover nutritious feed crops that will yield well in the hot moist climate of the region. It is believed that by proper experimentation with the hundreds of species of grasses, legumes, and other hay crops found in this type of climate (either in the United States or in other parts of the world) this need could be met. Recent experiments with Lespedeza (Japanese clover) indicate that it would make an excellent pasture and hay crop for at least part of the region. The soy bean and other legumes have also given promise of success.

Control of livestock diseases. The livestock industry of the Cotton Belt has also been handicapped by diseases. For example, the Texas tick fever has killed thousands of cattle in this region. The disease is spread by parasites carried by ticks. When this fact became known the United States Congress appropriated money to eradicate the disease. This task has been almost completed.

THE CHANGING SOUTH

The South is now making an earnest effort to make a better human adjustment to the natural environment. The many difficult problems that have troubled them are being attacked scientifically. There is reason to believe that the livestock industry of the Cotton Belt will be much better developed in the future than it has been in the past. Increasing effort is being given to finding new and better feed crops suited to the region; great effort is being made to bring animal diseases under control; and the people are being taught the value of animal industries.

Soil conservation, diversification of crops, and the improvement of animal husbandry are only a few of the ways in which the Cotton

Belt is improving its conditions. Industry is being promoted, roads are being built, hydroelectric power is being developed, tree crops are being grown, education facilities are being improved; and human diseases, such as hookworm, malaria, and typhoid, are being brought under control. These changes indicate that, in the near future, the economic status of the Cotton Belt will compare more favorably with other important agricultural sections of the nation than it does at present.

QUESTIONS AND EXERCISES

- 1 Discuss the probable importance of cotton to the South if the cotton gin had not been invented?
- 2 Why are cotton and cotton goods the most important products of international trade?
- 3 How have the cotton industries influenced social conditions within the United States?
- 4 Describe the social and economic conditions in any two sections of the Cotton Belt. Show the relationship existing between the social conditions and the natural environment of any section of the Cotton Belt.
- 5 Discuss the advantages and disadvantages of western Texas for cotton production.
6. Write a 400-word composition on the subject: A Major Problem of the Cotton Belt Farmer.
- 7 Is the serious erosion of the Cotton Belt a result of poor methods of farming or of adverse natural conditions? Explain.
- 8 What do you consider to be the most serious handicap of the Cotton Belt farmer? Why?
- 9 What are the major problems of stock-raising in the Cotton Belt?
- 10 What major economic and industrial changes are taking place in the Cotton Belt?
- 11 What is the outlook for economic and social improvement of the Cotton Belt?

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Climate, Health and Energy, pp 375-410

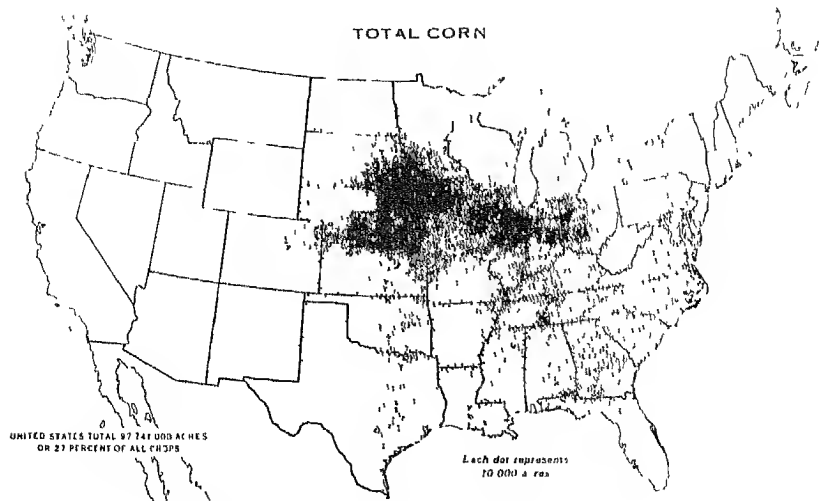
Corn is, and always has been, America's most valuable crop. It had been grown by the Indians for centuries before Columbus discovered America. It was the most valuable crop of the early colonists, it held first place among the crops of the frontiersmen as they marched westward across the humid portions of the United States, and it is the most important crop of America today.

Corn and colonization. When the colonists settled in Massachusetts and Virginia, the Indians taught them how to grow corn. Within seven years after the settlement of Jamestown, the Virginia colonists were cultivating more than 500 acres of corn annually. Within 25 years they were producing a surplus for export to Europe. Corn, more than any other crop, enabled the early colonists to adjust themselves to their new environment with the least amount of inconvenience and suffering.

Corn was an ideal crop for these early settlers. It could be planted in the deadened forest and would yield a fair return without a great deal of care. It could be planted and cultivated with simple tools such as the spade and the hoe. It did not have to be harvested at any specific date. If the colonists were busy building houses, hunting, or fighting during the fall when the crop matured, the harvest could be delayed until winter, or if necessary until spring. Finally, the grain was relatively nonperishable and would keep for several months even with poor care.

Corn had many advantages over most other crops. It could be used either as food for man or as feed for his animals. It made a wholesome and nutritious food when parched or when made into hominy or corn bread. It could be eaten before maturity as roasting ears. When fed to animals it helped supply milk, butter, and meat. The fodder made good feed for livestock and could be used as roofing and siding for sheds. These many qualities and uses of corn made it an ideal crop for the early colonists.

A pioneer crop. Corn yields fairly well in a great variety of climates, and some is grown in every state of the Union. The same qualities and uses that made it an ideal crop for the colonists made



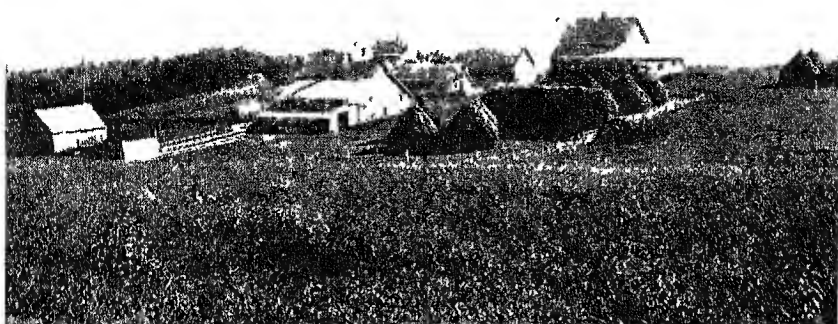
Average of grain, silage, forage, and hogged-off land (Courtesy U S Dept of Agriculture)

it also an excellent crop for the early pioneers. As the people moved westward, corn was the most important crop carried with them. By 1840 the crop had spread westward to approximately the western boundary of Missouri.

The invention of the steel plow by John Deering in 1837, at about the same time that the great American Prairie was being settled, was of tremendous value to the corn planter. The heavy sod could now be turned over with ease. The advance of canal-building, and later of railroad construction, opened the prairies to commercial agriculture.

The Corn Belt. After centuries of corn-growing in America, its most intensive culture has become firmly established in a region known as the Corn Belt. Corn is still grown in every state in the Union, but much more than one-half of the national crop is produced within the Corn Belt. (See map on page 136.)

The Corn Belt is the most productive of the large agricultural regions of the world. There are other selected areas such as the Nile Valley, and parts of the Yangtze Valley that are as productive as the best parts of the Corn Belt. These areas, however, are small, whereas the Corn Belt covers an area of approximately 220,000 square miles. Nowhere else is there a continuous tract of land of such magnitude that is so fertile and that yields such bountiful crops.



A typical well-kept farm in Iowa (Courtesy U S Dept of Agriculture)

The Corn Belt produces not only one-third of the world's corn crop, but it also yields bountiful crops of oats, wheat, hay, potatoes, apples, and other agricultural and horticultural products. This area probably produces more food per square mile than any other large region of the world. More than nine-tenths of the land is in farms and three-fourths of it is in crops.

The average value of the farms of this region surpasses that of any other large section of the United States. The high state of the general prosperity and progress of its agricultural population is indicated by its widespread use of modern conveniences. This region has the largest rural sales of automobiles, telephones, radios, electric refrigerators, and other conveniences and luxuries of any farming area of the world.

In normal times the many excellent and well-painted homes, well-kept lawns, wire fences, large mileage of surfaced roads, efficient farm machinery, and excellent schools all indicate a rather high degree of agricultural prosperity. Moreover, a large percentage of the farm boys and girls are given the advantages of high school and college training.

It is one of the few areas of the world where a large number of farmers are able to retire while still relatively young and healthy. Many of the farmers spend their last years in small towns or in cities where they have more conveniences than rural communities afford. Thousands of these farmers are sufficiently independent financially to live during their declining years in California, Florida, or other climates of their choice.

Causes of great productivity of Corn Belt. What factors have made the Corn Belt so exceedingly productive? The answer is to be found in a study of (1) the natural environment, especially climate, soil, and topography, and (2) the cultural environment, especially the scientific method of agriculture and stock breeding, and the use of efficient machinery

The natural environment. The climate of the Corn Belt is almost ideal for the production of bountiful crops. The summers are warm, and the rainfall is normally plentiful. The heaviest rainfall for the area comes during May, June, July, and August when it is of greatest use.

Thanks to the influence of glaciation, the topography is relatively gentle and the soil fertile. Thousands of years ago, a great sheet of ice and snow (a glacier) hundreds of feet thick pushed southward from Canada and covered most of the Corn Belt. The glacier pushed off the tops of the hills and filled many of the valleys, giving the region a flat to rolling topography.

Why are the soils of the Corn Belt more fertile than those of the Cotton Belt? A study of the ways in which these soils were made gives the answer. Most of the Cotton Belt soils are *residual*. That is, they were weathered from the underlying rock formations and have remained (resided) in the place of formation. These soils have been subjected to heavy rains, both summer and winter, for hundreds of thousands of years. Consequently, much of the soluble mineral content has been dissolved and carried away. By this process, called *leaching*, the soil has been robbed of a large part of the original mineral fertilizers such as calcium, phosphate, nitrogen, and potash.

The Corn Belt soils are young. Only a few thousand years ago the glacier dug up large quantities of rock that had been buried deep enough that it had not been leached by the rains. The glacier pulverized this rock and spread it over a large part of the Corn Belt. This pulverized rock, called *glacial flour*, has been exposed to the weather but a relatively short time. It therefore retains most of its original mineral fertilizers.

The cultural environment. The Corn Belt states support the finest agricultural colleges of the entire world. These schools train young men who go out as agricultural advisers to all parts of the region. They also educate thousands of young men who go back to farms and

put their scientific agricultural training to use. The Corn Belt states also support many agricultural experiment stations where scientists work for the improvement of crops and animals. There, also, soils are tested to determine the amounts and kinds of fertilizers needed for the most profitable crop yields.

The Corn Belt is also a region where excellent agricultural machinery is efficiently used. It is true that crop production of this region does not lend itself to the type of large-scale machinery used in the Spring Wheat Belt. Yet year after year new or improved machines, especially suited to Corn Belt agriculture, have been introduced. The result has been that man power has been gradually giving way to machinery.

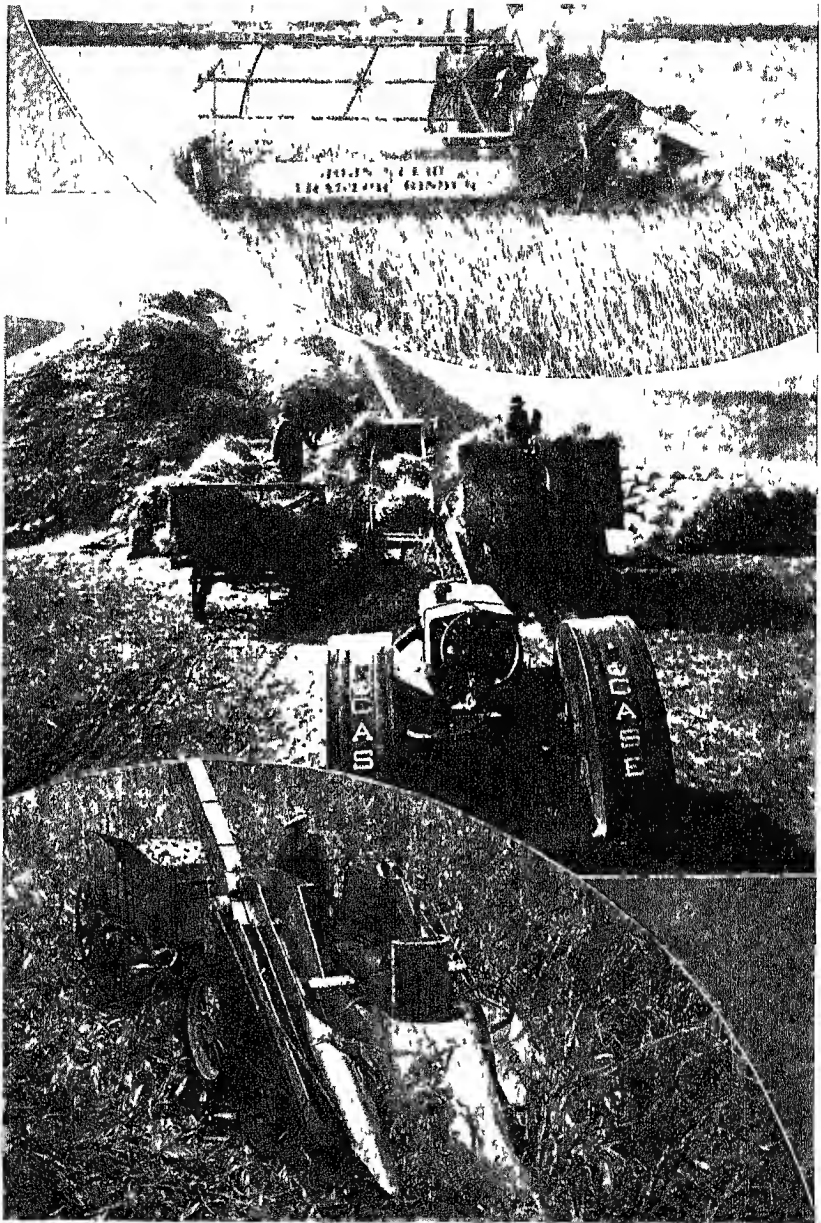
Perhaps the most time-consuming task of the farmer is that of tending his corn. This crop has to be cultivated several times while the stalks are still young and tender. It has been difficult to devise a machine that will cultivate efficiently more than one row at a time, especially on sloping land. Occasionally the two-row cultivator is used, but the practice is not common. With the one-row cultivator it is difficult for one man to care for more than 40 to 60 acres annually.

Until recently, the only practical method of husking corn was by hand. Under such conditions, a man had to work hard to harvest two or three acres a day. Thus, if a farmer tended 60 acres of corn, it required 20 to 30 days to harvest the crop without the aid of extra laborers. During the last few years corn-husking machines have been devised which increase the harvesting capacity of a laborer several fold.

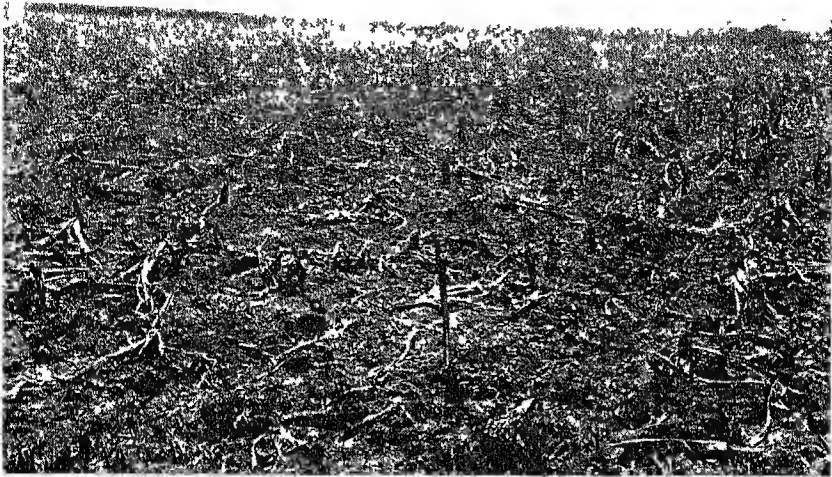
The machinery used in harvesting wheat, oats, and other small grain crops of the Corn Belt is much the same as that used 30 years ago, except that the tractor is replacing the horse as a motive power (Illus., p 134.) These cereals are threshed with a portable machine that can be quickly and easily moved from one field to another.

Some of the greatest labor-saving devices of the farm are the improved machines used in caring for the hay crop. A few years ago, practically all of the hay was handled once or twice by use of the pitchfork. Pitching hay is the hardest kind of labor. Today, much of the hay is loaded in the field by mechanical devices, and unloaded at the barn or stack by the use of machinery.

Use of machinery and decline of agricultural population. The use of agricultural machinery has resulted in a decrease in the rural



The tractor (*top*) has largely replaced the horse in many agricultural regions in the United States. Light, portable threshing machines (*center*) can be easily and quickly moved from field to field. The use of the mechanical corn picker (*bottom*) has lightened the burdens of the Corn Belt farmer. (Courtesy John Deere Company and J. I. Case Company.)

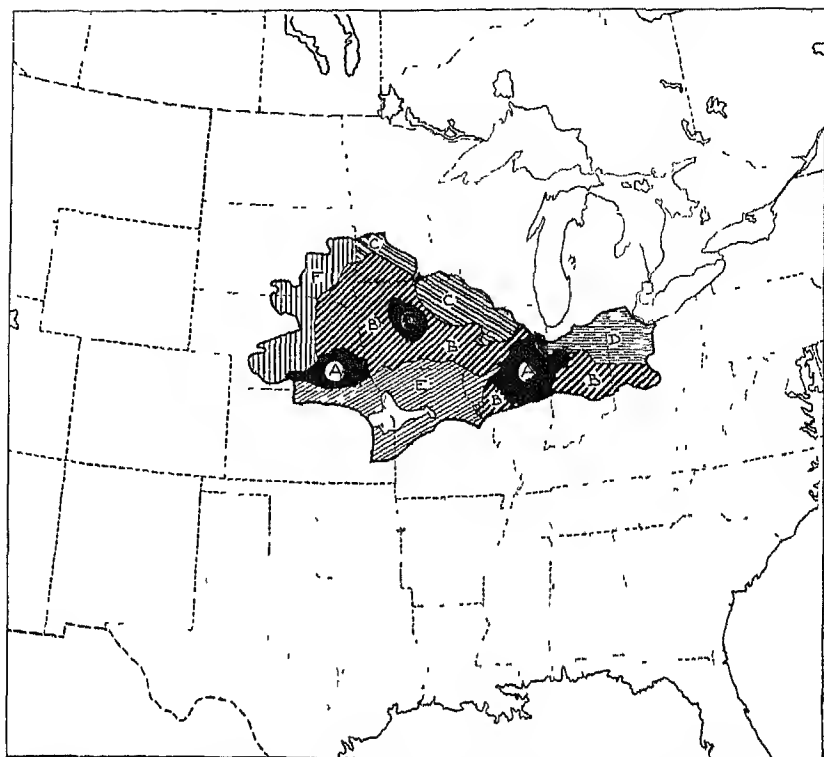


Drought and hot winds have completely destroyed this corn crop that would have amounted to 30 or 40 bushels per acre with a favorable season (Courtesy U S Dept. of Agriculture)

population, not only in the Corn Belt, but also in many other sections of the United States. Many of the farm boys have gone to the city to find jobs in automobile factories, steel mills, textile mills, and other manufacturing industries. Many of the girls go to the city to find work in department stores, offices, and factories.

The decreasing use of the horse. In 1919 and 1920, approximately 28,000,000 horses and mules were supported on our farms and in our cities. By 1937 the rapid rise of the automobile and autotruck had greatly reduced our need for draft animals. As a consequence, the number of horses and mules in the United States had dropped to approximately 16,000,000. This reduction of horses and mules has released about 20,000,000 acres of land for food or industrial crops that were formerly required for feed crops.

Weather and the corn crop Weather is the uncertain factor of the farmer, not only of the Corn Belt, but of the world. The American Corn Belt has the most reliable weather for corn to be found any place in the world. Even in this favored area, droughts, floods, hot winds, and other adverse weather conditions sometimes greatly reduce the yield or even destroy the crop.



The shaded area—the Corn Belt—is the most productive large agricultural region in the world. See text for meaning of the various symbols

SUBREGIONS OF THE CORN BELT

Although corn is the most important crop in all parts of the Corn Belt, the types of agriculture differ markedly from one part of the region to another. These differences are indicated by the sizes of the farms, the types of crops, the types of livestock industries, and in many other ways

Cash grain subregions. The areas indicated as "A" in the map of the Corn Belt above are primarily given to the raising of grain crops for cash. In the Illinois and Iowa areas, corn and oats comprise three-fourths to seven-eighths of the cropped area. In Nebraska corn and wheat are the major crops. Although these cereals are produced primarily as cash crops, the livestock industry is also important. Many cattle and hogs are fattened in these areas, but the income from these animals is relatively small as compared with the income from grain.

Livestock feeding area. In the large area marked "B" in the illustration on page 136, are the greatest livestock feeding regions in the world. Within the areas "A" and "B" are fattened more than one-half of all the hogs slaughtered in the United States each year. These areas also rank first in the production of corn-fed cattle. Thousands of cattle, pastured on the Great Plains, are shipped annually to this section of the Corn Belt to be fattened before they are sent to the packing plants of Chicago, Kansas City, and other large packing centers.

Livestock dairy area. Along the northern border of the Corn Belt, dairying is the most important agricultural enterprise, with the fattening of hogs and cattle ranking second. Feed grains (corn, oats, and barley) and hay are the important crops. In this area an increasing percentage of the corn is cut before it is fully mature and put in silos. The silo is a barrel-shaped container, 15 to 20 feet in diameter and 30 to 40 feet high. The entire corn crop—stalks, leaves, husks, and ears—are cut into small bits, mixed together, and put into the silo where they are kept moist by their own juices. The product is called *silage*. The silage will keep for years and makes the finest kind of feed for both dairy and beef cattle.

The silo has an added advantage in the northern part of the Corn Belt where summers are short. It permits the corn crop to be harvested several weeks before the corn is fully mature. Thus the frost-free season required to grow corn for silage need not be as long as that required to grow corn for its grain.

General farming subregion. The area marked "D" is a general farm region, but with a slight emphasis on corn. The area is the least fertile part of the Corn Belt and is poorly drained. Hay, oats, and wheat are important, and specialty crops, such as sugar beets, onions, and mint, are emphasized in certain locations.

Other subregions. The area marked "E" is the transition zone from corn to winter wheat. Similarly the area marked "F" is a zone of transition from corn to pasture. Within this western margin of the Corn Belt the rainfall is light and the crops are relatively poor.

MEAT-PACKING INDUSTRY

Growth. Before the days of rapid transportation and efficient refrigeration, the meat industry was confined largely to the home or to the community of its consumption. The farmers butchered hogs and cattle and smoked or salted the meat in order to preserve

it Most slaughtering and meat-packing plants were located in the cities or villages to take care of local needs. Since the East was the most densely populated section of the United States, it was also the major center market of the slaughtering and meat-packing industries.

Cattle can walk long distances within a relatively short period of time. In the early days it was not uncommon to drive cattle from the sparsely populated Ohio Valley to the more densely settled area of the East for slaughtering. Hogs cannot travel so well; consequently, most of them were raised in the region in which they were consumed.

With the growth of canal and river transportation, Cincinnati became the greatest slaughtering and meat-packing center of the United States. Later, with the development of rapid transportation and efficient refrigeration, new adjustments in location were made. Year by year an increasing percentage of the meat-packing industries was removed from the great consuming markets of the East to the regions of animal raising.

The reasons for this change in the location of the slaughtering and meat-packing industries are easily understood. The amount of merchantable meat obtained from cattle and hogs averages only 50 to 65 per cent of their live weight. Moreover, live animals cannot be packed in a car so efficiently as can meat. As a result, it is much more expensive to ship live animals than to ship the meat obtained from them. Then, too, when live animals are shipped long distances there are losses from sickness, death, or shrinkage in weight. Meat can be shipped without this loss.

Present distribution of the packing industry. At present the most important meat-packing plants are located close to the great livestock areas. The six largest packing cities are Chicago, Kansas City, Omaha, New York, Indianapolis, and St. Louis. Chicago, however, produces almost as much meat as the other five cities combined. In fact, Chicago is the greatest meat-packing city in the world, with an output of approximately one-fourth of all the meat produced in this great nation.

Many factors favor the development of Chicago as a meat-packing center. It lies on the border of the Corn Belt, the greatest hog-raising and cattle-fattening center in the world. It is also the greatest railroad center in the world. This great railroad system favors the assemblage of livestock from a large portion of the Corn Belt and permits easy distribution of meat, lard, and other animal products to all parts of the United States.

QUESTIONS AND EXERCISES

- 1 How do natural factors help make the United States Corn Belt the most productive large agricultural region of the world?
- 2 How do cultural factors favor large productivity of the Corn Belt?
- 3 Why do the farmers of some sections of the Corn Belt sell most of their corn, while in other sections they feed most of their corn to animals?
- 4 Why is the silo used more extensively in the northern part of the Corn Belt than in the southern part?
- 5 Why, as a rule, are the soils of the Corn Belt more fertile than those of the Cotton Belt?
- 6 Why was corn an ideal crop for the early American colonists?
- 7 Where are the large meat-packing centers of the United States? What factors favor these locations for the meat-packing industry?
- 8 How does the natural environment influence the farmer's activities in the United States Corn Belt? (Read Smith, J Russell, *North America*, pp. 290-320)

FURTHER READINGS

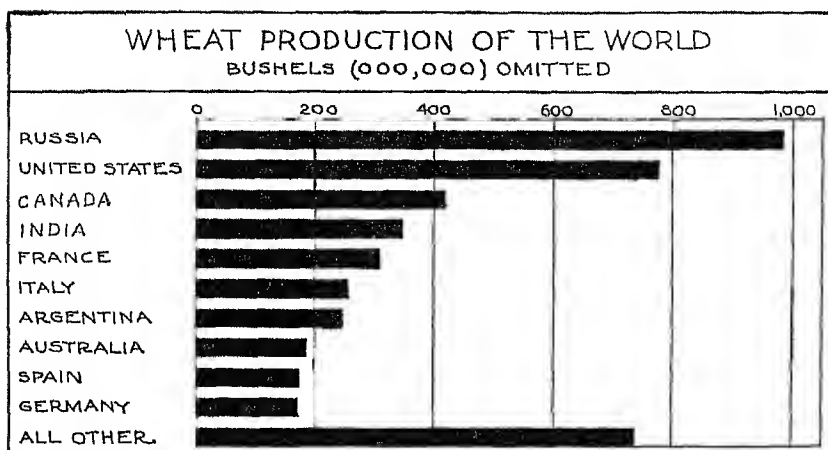
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- Klumm, Lester Earl, Starkey, O. P, and Hall, N F., *Introductory Economic Geography*, Harcourt, Brace and Company, 1937 Pp. 148-154
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WHEAT PRODUCTION AND MARKETING

Importance of wheat. Bread has been called the "staff of life," and wheat is the most important of all bread-making cereals. As far back as we have any record of man's food, he ate wheat. It is mentioned in the earliest books of the Bible, and indications of its early use have been found in the caves of southern Europe. Pictures on the tombs of the early Egyptian kings show men harvesting wheat. In spite of the long history of this cereal, its large-scale commercial production is of recent origin. The development of modern transportation facilities and the invention of labor-saving farm machinery gave such added momentum to wheat production that the world output has been doubled during the last few decades.

Today, hundreds of varieties of wheat are grown under diverse climatic conditions. Its production has been adjusted to climates of widely scattered areas extending from the equator to 60 degrees north latitude. Scores of countries now cultivate this cereal, and every civilized country in the world consumes considerable quantities of wheat bread. It has been estimated that it is one of the major items of diet for at least 600,000,000 people—approximately one-third of the population of the world. No other cereal except rice compares favorably with wheat as food for the human race.

Where the world's wheat is grown. The successful cultivation of wheat requires (1) a cool growing season with a moderate amount of moisture, and (2) a moderately dry and warm ripening and harvest season. Yet, as already stated, these conditions exist in a great variety of climates. Fine crops are harvested within a few hundred miles of the Arctic Circle. The long, intensive summer days with 18 to 20 hours of sunshine, together with the short nights when the sun is only a few degrees below the horizon, give sufficient heat for the maturing and harvesting of the crop. The cool growing season may occur in early spring, as in Minnesota; it may be in both fall and spring, as in Oklahoma; it may be in early summer, as in Alaska; or it may be in winter, as in India. The moisture may be secured from irrigation waters, as in Egypt; it may be supplied by the rainfall that has been stored in the ground for a few years by



The average annual wheat production for the ten-year period, 1931 to 1940. These ten countries produce approximately 85 per cent of the world's wheat.

dry-farming methods, as in parts of Washington, or it may be derived largely from rainfall of the immediate growing season, as in Kansas.

The moderately dry ripening and harvest season comes at various times of the year, depending upon the type of climate in which the wheat is grown. For example, wheat harvest begins in Oklahoma in early May, whereas it does not begin in Kansas and Nebraska until late June and early July. In Alberta, Canada, the crop is not ready for harvest until the latter part of August or early in September.

In spite of the wide distribution of wheat culture, more than 90 per cent of the world's crop is grown in six large areas. They are, in order of importance, Europe, interior North America, eastern Asia, India, Argentina, and Australia. More than 85 per cent of the world's wheat crop is grown in 10 countries.

Recent spread of wheat culture within the United States. Prior to 1880 practically all of the wheat crop, not only of the United States, but of the world, was grown in regions having a plentiful supply of precipitation, or in irrigated areas. Wheat culture was not yet considered profitable in most semiarid lands. During the last 60 years, however, several factors have worked together to cause the spread of wheat culture to lands that have light rainfall. The most important of these factors are: (1) the use of large-scale machinery, (2) the improvement of transportation facilities, (3) the discovery

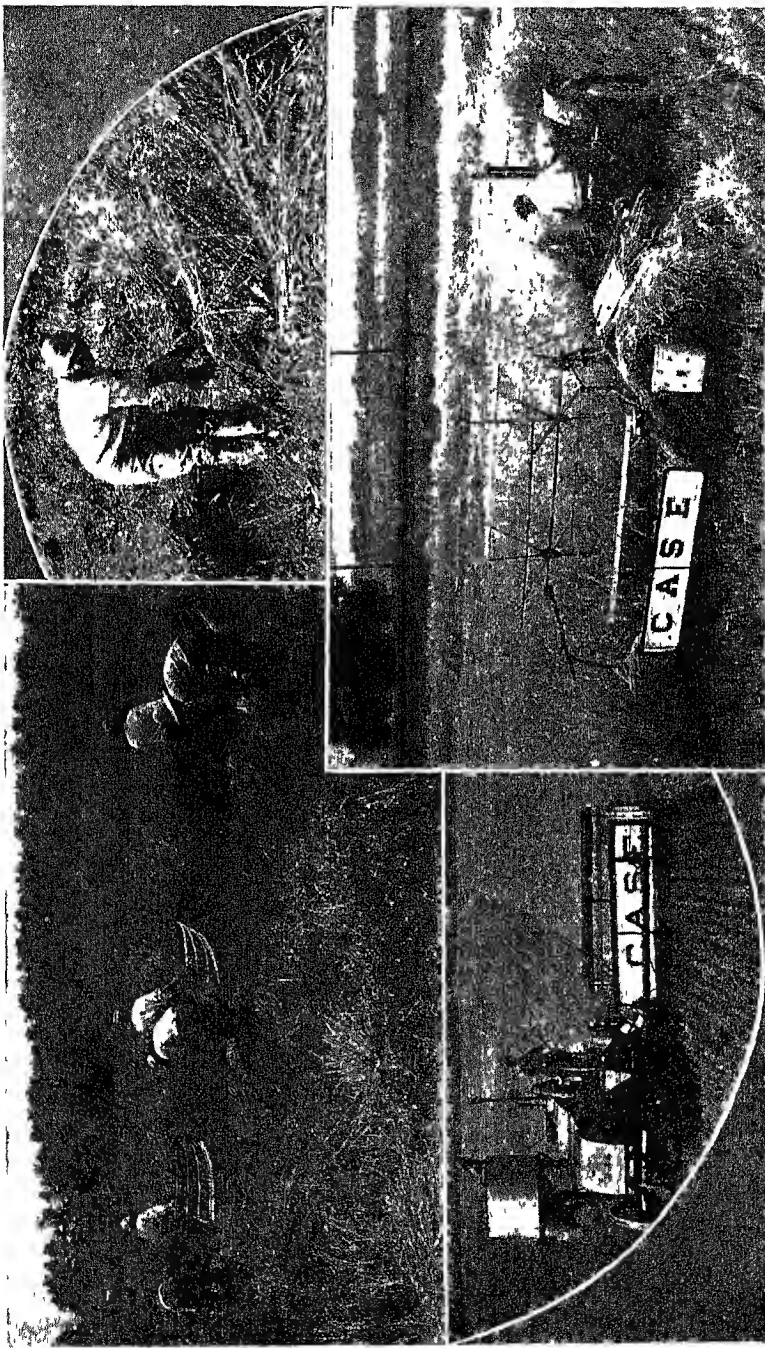
and cultivation of drought-resisting varieties of wheat; (4) the practice of dry-farming, and (5) the depletion of the soils in eastern states where wheat was formerly grown on the same land year after year

Use of large-scale machinery As late as the middle of the nineteenth century, the wheat farmer of the United States and other parts of the world possessed but few mechanical devices to aid him in the production of wheat. Within the United States most of the farmers plowed their land with a two-horse plow, sowed the wheat broadcast or with small drills, harvested the crop with cradles; and threshed the grain by use of the flail or of small machines operated by horsepower. In most other parts of the world the wheat farmer was handicapped even worse than in the United States. Under such conditions, one man could care for only a small acreage of wheat. Consequently, the crop could not be profitably grown unless the yield per acre was relatively large.

In 1831, Cyrus McCormick invented a reaper which cut the grain and dropped it in bundles to be bound by hand. Later a binder which also tied the bundles was invented. These labor-saving devices were followed by the header and thresher, or great combines which cut the grain and threshed it at the same time. Similarly the flail, treading floor, horsepower threshing machine, and other inefficient methods of separating the grain from the straw, were replaced by modern threshing machines. (Illustration opposite.) The spade and two-horse plow gave way to the tractor, the disk plow, wide harrows and drills, and other large-scale machinery. With such mechanical equipment a large acreage of wheat could be sown and harvested by one man.

Use of modern transportation facilities. Wheat is a relatively heavy and bulky product. As long as wheat had to be transported by the muscular energy of man or beasts of burden, one could not afford to ship it long distances; but by use of modern trucks, railroads, and steamships, wheat can be transported thousands of miles for a few cents a bushel.

It has been seen that the use of modern machinery made it possible for one man to sow and harvest a large acreage of wheat. Similarly, modern transportation facilities enable the farmer to send his crop to distant markets at a relatively small cost. These improvements in methods of sowing, harvesting, and marketing wheat have made it profitable to grow this crop on land that yields only seven



Before McCormick invented the reaper in 1831, the cradle (top left) was the most efficient means of cutting grain. The cradle and the reaping hook (top right), used in harvesting wheat, still are used in some parts of the world. The two lower pictures show modern machines which enable two men to cut and thresh 40 to 60 acres of wheat in a day in arid parts of the United States (Courtesy International Harvester Company and J I Case Company)

to ten bushels per acre. Many million acres of semiarid lands have, as a result, been added to the area which can be profitably given to wheat.

Influence of introducing and breeding new varieties of wheat Even with the aid of modern machinery and transportation facilities, vast tracts of semiarid lands are too dry for the profitable production of those varieties of wheat that yield best in eastern United States and other humid areas. The introduction of Red Fyfe, durum, and other drought-resisting varieties of wheat has permitted the extension of wheat culture into drier lands than would otherwise have been possible.

Reduction of wheat acreage in eastern United States The need for the expansion of wheat acreage in the dry lands was increased by the reduction of the acreage in the humid portions of eastern United States. During the period just before the war between the North and South, the area now known as the American Corn Belt was the most important wheat-growing section of the United States. The continued growth of wheat on the same land, year after year, robbed the soil of its fertilizers, with a resultant decrease per acre. Moreover, in these humid lands, diseases and pests such as the chinch bug, the Hessian fly, and rust attack the wheat when the crop is continuously grown on the same land. For these reasons, it was fortunate that in the early eighties we discovered that the drier lands situated within the Great Plains were suited to wheat. As will be explained later, the overexpansion of farming on these dry lands has probably resulted in an unnecessary waste of one of our most valuable resources—the soil.

The influence of dry-farming Millions of acres of our land are too dry to permit the growth of a profitable wheat crop each year. The difficulties are too great to be overcome by the use of large-scale machinery, improved transportation facilities, and drought-resistant crops. Accordingly, in large sections of the Great Plains, and in most of the Columbia Plateau, it has been found necessary to practice dry-farming.

The following principles are involved in a system of dry-farming. In the first place the land is allowed to lie fallow (without crop) for one or two years in order to store enough moisture in the soil for the growth of a crop the following year. During the fallow period, the land is kept clean of vegetation. It is especially necessary to keep down all weeds, for they take up moisture rapidly. Another require-

ment of dry-farming is to keep the ground mellow by plowing and harrowing it, and to keep the topsoil pulverized. This loose topsoil quickly absorbs any rain that falls instead of allowing it to run off.

The next requirement of dry-farming is to hold the moisture in the ground until it is needed. Under normal conditions, much of the water that sinks into the soil soon creeps back to the surface and is evaporated. It is essential to check such evaporation as much as possible. This is accomplished by keeping the topsoil pulverized. When the topsoil is allowed to harden, small tubelike openings (capillary tubes) are formed in it, which conduct the moisture freely to the air where it is evaporated. If the surface is cultivated so as to keep a *dust mulch* on top, such tubes cannot form and the escape of the moisture is retarded. As a result, the moisture is stored for use in future crop production.

Increase of agriculture on dry lands. It has been seen that the use of large-scale machinery, the improvement of methods of transportation, the cultivation of drought-resistant crops, and the practice of dry-farming have all combined to expand the acreage of cultivated land in dry regions. Thus during the last few decades an increasing percentage, not only of our wheat crop, but also of our sorghum, millet, and cotton crops, has been grown in semiarid regions.

The cultivation of semiarid land and its relation to wind erosion. The most rapid expansion of agriculture in semiarid regions normally takes place during unusually wet years when crops are exceptionally good. These are usually followed by exceptionally dry years when crops fail. For example, in 1914, 1915, and 1916, the rainfall of most sections of the Great Plains was exceptionally heavy, and crops were correspondingly good. At the same time, owing to the World War, the price of wheat was high. These two factors worked together to cause daring farmers to push forward into areas that are normally too dry for agriculture. These pioneer farmers plowed up the short grass and sowed the land in wheat. Even in these abnormally wet years, the rainfall was so light that the yield of wheat within large areas was less than 10 bushels per acre. However, since the farmer could tend a large acreage, and since the price of wheat was high, large profits were made in spite of the low acreage yield.

After the wet years came the inevitable period of dry years. Crops completely failed and thousands of farmers were forced into bankruptcy. This same cyclic rainfall (a few wet years followed by

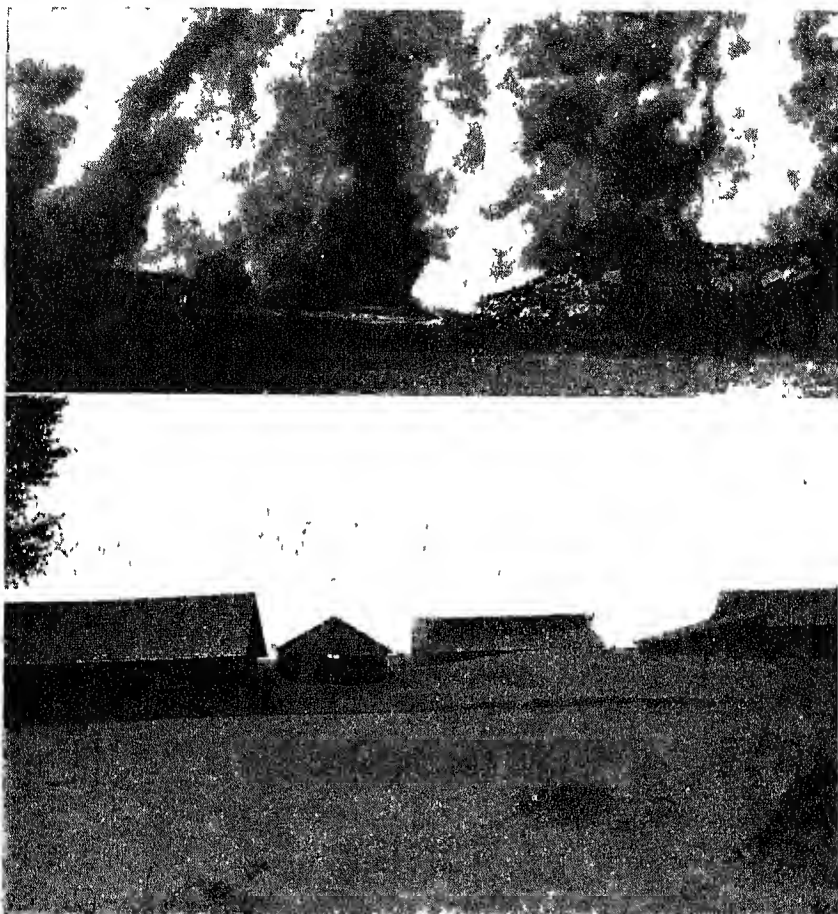
a few dry years) has occurred over and over on the Great Plains. During the wet years there is always overexpansion of agriculture. During the dry years thousands of farmers are financially ruined and driven from their homes by drought and crop failure. At present thousands of square miles in Texas, Oklahoma, Kansas, and other Great Plains states appear as a great desolate waste. Land that was once productive is now without crops. Homes that were once occupied by prosperous and happy families are now deserted, and some of the families are on the government payroll or on relief.

Wind erosion. A few wet years just prior to 1930, together with high prices of wheat and other farm crops, brought about the greatest expansion of agriculture ever experienced in our semiarid lands. These wet years were followed by the driest years on record—1932-1936. The cultivation of previous years had loosened the soil, leaving it in excellent condition to be blown away.

During the years 1933 and 1934, local dust storms became increasingly more common on the Great Plains. They were for the most part limited to a few hundred or at most a few thousand square miles. Then on May 11, 1934, occurred the worst dust storm that this nation had ever experienced. Almost without warning the sun was blotted out, or at best was greatly dimmed, by a yellow and black dust storm that covered nearly a million square miles of central and eastern United States.

This black blizzard has been followed during the last few years by many others similar to it but of less intensity. Billions of tons of fertile soil have been moved distances which range from a few miles to thousands of miles. In some areas practically all of the soil has been carried away. In other places it has been deposited in piles around houses and along fences. Millions of acres of newly sown seed have been uncovered by the wind, while other millions of acres have been covered with enough dust to destroy the crops. Wherever precipitation is associated with one of these dust storms, muddy raindrops plaster houses, automobiles, and windowpanes with an unsightly covering of topsoil carried in from the Great Plains.

It is probable that the best solution of the wind erosion of the Great Plains is to be found in stopping the extensive cultivation of the soil and in returning a large part of the area to pasture. Also, wherever feasible, it is advisable to plant trees and shrubbery. The trees may act as a windbreak, and at the same time the roots help to hold the soil. For example, it was found in North Dakota that the



A "black blizzard" sweeping across the plain (*top*) Behind it will be left dust-covered homes (*bottom*). Such dust storms are largely the result of over-expansion of agricultural and pastoral industries of the Great Plains (Courtesy Soil Conservation Service, U S Dept of Agriculture)

areas that were provided with numerous windbreaks were much less disturbed by wind erosion than were the areas not thus protected.

Water erosion. Wind erosion removes the topsoil and leaves the surface in excellent condition for water erosion wherever heavy rains fall. In parts of the Great Plains, the land is so badly gullied that it has been called the "Bad Lands" A vegetative covering is the best remedy for such gullyng



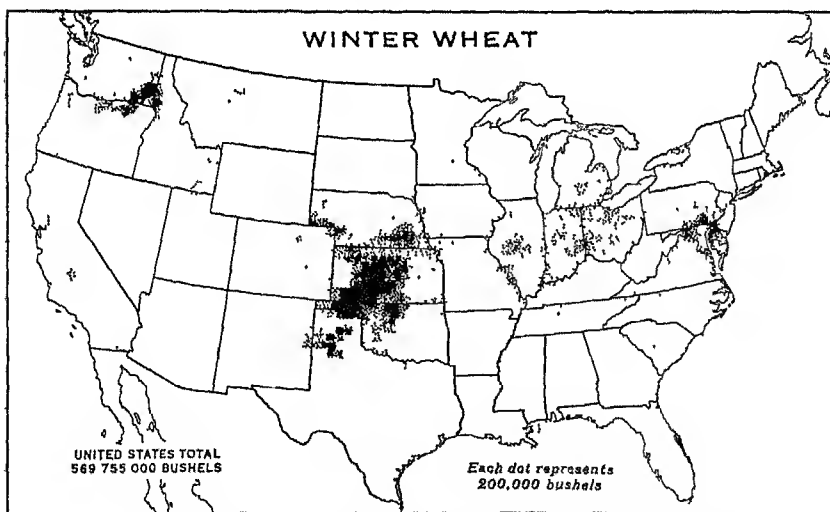
How vegetation prevents erosion These scenes in Borgamiller Gulley show vividly the value of soil conservation. (Courtesy Soil Conservation Service, U. S Dept. of Agriculture.)

DISTRIBUTION OF WHEAT PRODUCTION WITHIN THE UNITED STATES

Wheat is grown in every state in the Union. In certain sections of the country, however, the crop is usually poor, because of adverse weather conditions. For example, the heavy summer rainfall and high temperatures of the Cotton Belt result in the development of rust, smut, or other diseases. The hot, moist climate also favors the multiplication of insect pests, which frequently destroy the crop. If the crop escapes damage by insects and diseases, it is frequently destroyed or seriously injured by heavy rains and winds during the ripening and harvest seasons. Other sections of the United States are too dry for wheat culture except by irrigation.

Although wheat is widely grown within the United States, the major portion of the crop is produced within three rather well-defined areas. They are (1) the Winter Wheat Belt, (2) the Spring Wheat Belt, and (3) the Columbia Plateau.

The Winter Wheat Belt. Winter wheat is sown in the autumn of one year and harvested in the early summer of the following year. After it is sown in the fall it grows to several inches in height before freezing weather sets in and the growth is stopped. It will live



Winter wheat—fall-sown wheat—is grown in areas where the winters are not very severe or where a covering of snow protects the wheat during the cold weather. (Courtesy U. S. Dept. of Agriculture.)

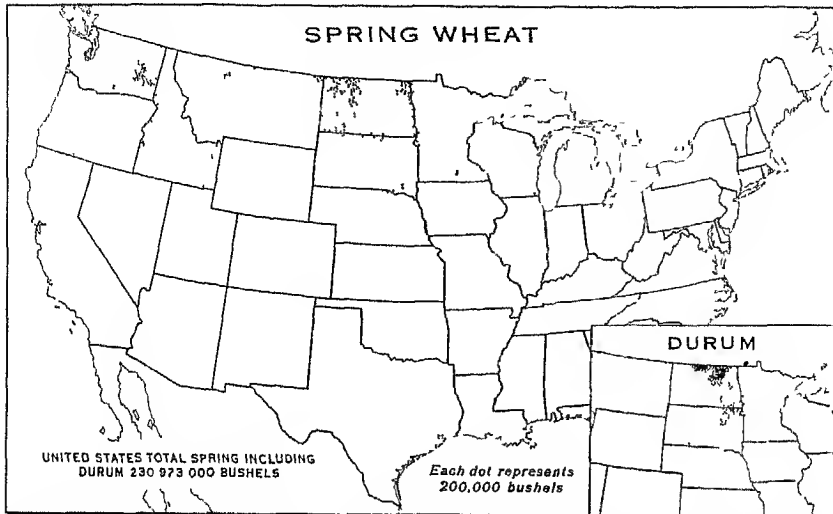
throughout the winter if the weather is not very severe. Even where the winters are cold, as in eastern Canada, it will live provided it is protected by a sufficient blanket of snow. Winter wheat, then, is sown in areas having mild winters or in regions of heavy winter snows. When warm spring weather arrives the wheat begins to grow again and is ready for harvest approximately three months later.

The finest section of the Winter Wheat Belt occupies parts of Texas, Oklahoma, Kansas, and Nebraska. For the most part this area is a level, treeless plain which lends itself to large-scale mechanized farming. This area produces the high-grade winter varieties that bring high prices on the world markets. This wheat, together with the hard spring wheat, is especially suited to the manufacture of breads by bakeries. Bread made from hard varieties of wheat can stand rougher handling without deterioration than can bread made from soft varieties. Since the bakeries are producing an increasing percentage of the nation's bread supply, the demand for hard wheat is also increasing.

The western and southwestern borders of the Winter Wheat Belt are beset by numerous hazards of agriculture. Light soils of a sandy character are common in these areas. These areas are the worst dust centers of the United States, and when wheat is killed or blown out, it is replaced in the spring by drought-resisting grain or is left fallow. Much of the land within this area has been broken only in the last 10 or 15 years. Prior to that time it was strictly ranching country. Since the rainfall of these areas is light and variable, the farming is beset by many hazards. Droughts, soil-blowing, insects, and hot winds have ruined many farmers within the last decade. Perhaps the land should have remained permanently in ranches.

A winter wheat area of lesser importance extends through Missouri, Illinois, Indiana, Ohio, Pennsylvania, Virginia, Maryland, and Delaware. This region produces soft varieties of wheat used extensively in making cakes, biscuits, pastries, and home-made bread.

The Spring Wheat Belt. Minnesota, the Dakotas, and other northern states are poorly suited to winter wheat. The winters are severe, and frequently the blanket of snow is exceedingly light. Consequently the wheat is sown during the early spring days and is ready for harvest during the late summer or early fall. The growing season of this region is short compared with that of the Winter Wheat Belt.



Spring-sown wheat is grown in regions having severe winters (Courtesy U S Dept of Agriculture)

This fact stands out more prominently when we consider that winter wheat gets a good start during the fall of the previous year, whereas spring wheat has but one short season for growing. The spring wheat region, however, has very long days, and the increase in the period of sunlight and warmth help to make up for the short length of the growing season.

The Red River Valley. The Red River Valley, renowned for its large yields of high-quality hard wheat, is the heart of the spring wheat region. This valley was once the site of a large lake (Lake Agassiz) which has since been drained, leaving a level lake bed as far as the eye can see. Highways, straight as arrows for many miles, fade in the distance with seemingly no end of level land.

Here, except for droughts, conditions are almost ideal for the production of bountiful crops of high-grade wheat. The soil is either glacial or lacustrine (sediment deposited in a lake) and is exceedingly fertile. The rainfall, approximately 25 inches, comes largely during the spring and early summer when the wheat is in greatest need of a plentiful supply of moisture. The fall of the year is relatively dry and sunny, affording ideal conditions for the maturing and harvesting of the crop. It is not surprising, then, that during the fall of the year the traveler in this region looks out over fields

of golden grain that seem to be endless. During the threshing season one may count from a given spot more than a score of threshing machines as they send up clouds of straw and chaff.

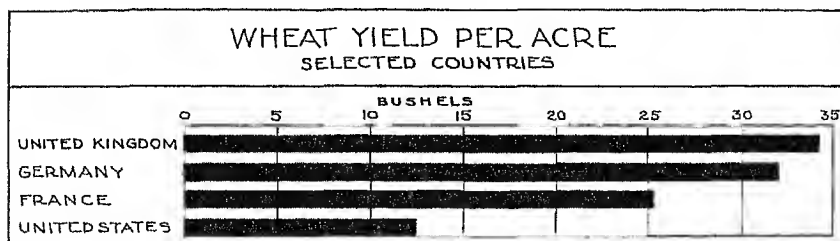
The farmer of the Red River Valley is just as dependent upon wheat as the farmer of the Cotton Belt is upon cotton. The region experiences great prosperity when the wheat crops are good and prices are high. On the other hand, poor wheat crops or unreasonably low prices result in depressions and sometimes in despair. When the crop is poor, every industry within the region suffers. Automobile sales fall off; groceries, clothing, farm machinery, and a thousand things normally sold in the region move but slowly from the store to the farm. When the crops are good and the prices are high, all industries of the region prosper.

Diversification of agriculture is as badly needed within the Spring Wheat Belt as within the Cotton Belt, yet the problem of selecting crops that may be profitably grown is a difficult one. The short and relatively dry season does not lend itself to a great variety of crops. Diversification is slowly taking place, however. The acreage given to potatoes, hay, corn for ensilage, barley, oats, rye, and other crops is gradually being increased in the more humid parts of the Spring Wheat Belt. Moreover, in recent years increasing attention is being given to the dairying industry.

Wheat farming on the Columbia Plateau. The wheat region centering in the Columbia Basin of Washington, Oregon, and Idaho is the most noted dry-farming region of the United States, if not in the world. In most parts of this area the precipitation is not sufficient to produce good crops of wheat each year. As a consequence, the farmer resorts to the practice of dry-farming. By this method of cultivation, the land is plowed in the fall. During the following year the topsoil is kept pulverized in order that it may absorb as much of the rain as possible. At the same time the dust mulch which is kept on top permits very little evaporation. The following fall or spring the farmer sows wheat and produces a good crop.

The Columbia Plateau is well suited to the use of large-scale machinery. The harvest season is exceedingly dry. Consequently, the crop can be left standing until the grain is completely matured in the straw. This practice permits the grain to be threshed at the same time that it is cut. It is only under such conditions that the combine (header and thresher) can be successfully used.

The wheat grown in this area is a white, soft grain which does not



Normally, the average wheat yield per acre of the United Kingdom is nearly three times that of the United States. To what extent can you account for this difference in acreage yield?

find a large market within the United States. A large part of it has been marketed in the Orient and in western Europe.

The exceedingly light rainfall of the Columbia Plateau—16 inches at Spokane—does not permit the production of many types of crops. As a result, there has been little diversification of agriculture. The problem of finding new crops that are profitable is made more difficult because of the geographic location of the region and the long freight haul to eastern markets. Up to the present, the farmers have been virtually compelled to grow wheat or nothing. Perhaps science may discover other crops suited to the region, but today the western half of the area is almost exclusively given to wheat and pasture, or permitted to lie fallow.

Yield of wheat within the United States. Because of the great expansion of wheat acreage into areas that are relatively dry, and into areas where the soil has been greatly depleted, the average acreage yield within the United States is not high. (Chart above.) Moreover, our extensive method of wheat farming does not lend itself to large returns per acre. The best acreage yields are produced in England, Belgium, and Germany under intensive methods of cultivation, and in areas that have relatively heavy and reliable rainfall. Yet, on the whole, the wheat grown in western Europe is classified as low-grade as compared with that produced in our own Great Plains.

MARKETING WHEAT

Exporting and importing regions. The great export wheat crop of the world comes from the large level plains of moderate to light rainfall and of relatively sparse population. The light rainfall re-

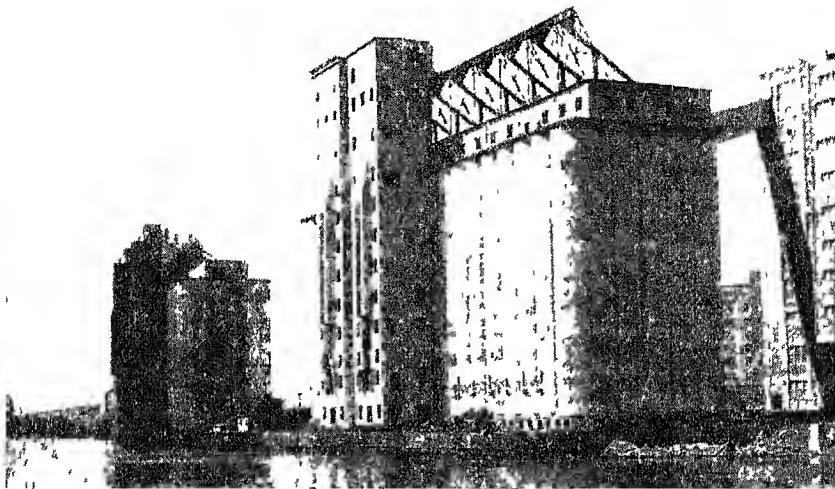
stricts the number of crops that can profitably be grown and thereby discourages the development of diversified agriculture. The level land permits the use of large-scale machinery and enables the farmer to produce wheat at a low cost. The sparse population consumes but small quantities of bread and leaves a large percentage of the crop for export. Hence the great subhumid and semiarid plains of Russia, the United States, Canada, Argentina, and Australia are the major wheat-exporting regions of the world, and give the countries in which they are located, leading positions as exporters. Even within our own country, some states are large importers of wheat and flour, whereas others are large exporters.

Transportation facilities and wheat production. No other crop is moved such great distances and in such large quantities as is wheat, together with its manufactured product, flour. True, the bulk of the world's coffee and tea crops and a large part of the world's cotton crop are shipped across one or more of the large oceans in the process of marketing, but these crops are neither so heavy nor so bulky as wheat. The world's cotton crop is normally something more or less than 6,000,000 tons, whereas the average world's wheat crop is approximately 135,000,000 tons. The export of wheat from a single country may be several times as heavy as the entire cotton crop of the world.

Since a large part of the world's wheat is shipped long distances, good transportation facilities are required if farmers are to make reasonable profits on their crop. The rapid building of railroads in our own Great Plains, in the Prairie Provinces of Canada, and in the wheat regions of Argentina and Australia were closely related to the expansion of wheat production in these areas. In southern Russia the rivers and canals were the major highways for many decades, but during recent years railroad-building has proceeded rapidly in this vast wheat-growing region.

Since the days of the early development within the northern interior of North America, the Great Lakes have provided a cheap highway for transportation. Each year millions of tons of grain reach the Great Lakes from the wheat-growing land of the United States and Canada. From here the wheat is shipped to the importing states of the industrial East, or to the markets of Europe.

Wherever there is a break in the method of shipping wheat, great grain elevators are needed for storage. Thus, at both the eastern and the western terminals of the Great Lakes, huge grain



The large grain elevators of Buffalo handle nearly 300,000,000 bushels of grain during prosperous years. Almost every variety of wheat passes through Buffalo. (Courtesy Buffalo Chamber of Commerce.)

elevators have been erected to handle and protect the grain while awaiting shipment. Similar facilities for the transshipment of grain have been provided at ocean ports. For example, during the Canadian harvest season, trainload after trainload of grain arrives at Vancouver. It is not practical to keep the grain in the cars until a ship arrives to take it to the Orient. Sometimes this wheat is stored for months before a market is found. Consequently huge grain elevators have been built at Vancouver. Likewise Montreal, the greatest wheat-exporting center in the world, has built large grain elevators along the water front.

Flour-milling centers. During the early days of our development, wheat was grown in almost every community of eastern United States. Most of this wheat was grown for home consumption and was milled locally. Thousands of small and inefficient mills were scattered throughout the country. In many cases the farmers took their wheat to the mill and exchanged it for flour. Usually the miller kept part of the flour as pay for his labor.

After 1890, several factors tended to revolutionize the flour-milling industry. Many of our wheat farmers became large-scale commercial farmers. As such, they could no longer consume any considerable percentage of the wheat they grew. Their product was intended

for the world market rather than for local consumption. At the same time, the rapid improvement in transportation facilities made it possible to ship the wheat to remote but modern mills for grinding. Under such conditions, the small and inefficient village mills were compelled to close down.

Gradually the great flour-milling centers developed near the great wheat-growing regions or along the routes which the wheat takes to market. For several decades Minneapolis was the greatest flour-milling center in the world. Minneapolis had the advantages of being situated near the falls of St. Anthony, where power could be developed, and near the great Spring Wheat Belt. Other important milling centers are Kansas City, Chicago, St. Louis, and Wichita, all well situated with respect to our Winter Wheat Belt.

Today, Buffalo is the greatest flour-milling center in the world. This city is situated along the greatest wheat marketing route in the world. All varieties of wheat pass through Buffalo on the way to market. Huge grain elevators contain soft wheats and hard wheats of every variety (Illus., p. 155.) Thus the Buffalo miller has at his very door the raw materials for the manufacture of all grades of flour. Buffalo is also situated close to the most densely populated portion of the United States, and near the most important commercial bakeries of the world. The mills can obtain cheap power from the many falls of this region. Perhaps no other city in the world has so many advantages for the development of the flour-milling industry.

QUESTIONS AND EXERCISES

1. What are the climatic requirements for the production of wheat?
2. Why can wheat be grown in so many types of climate?
3. What factors have favored the rapid increase in wheat production during the last few decades?
4. What principles are involved in dry-farming?
5. What dangers are involved in overexpansion of wheat culture on the Great Plains?
6. How may natural factors cause wide fluctuations in the price of wheat from one day to another? Study the wheat prices in your daily paper for awhile and see what causes are given for the daily fluctuations in prices.
7. Why is Buffalo better suited for the manufacture of flour than is Cincinnati?

- 8 Write a composition on one of the following subjects.
 - (a) A Day on a Wheat Farm
 - (b) A Visit to a Flour Mill
 - (c) A Drive Through a Wheat-growing Region
- 9 What countries are major exporters of wheat? Why?
- 10 How does the natural environment influence wheat production in the winter and spring wheat regions? (Read Smith, J Russell, *North America*, pp 539-565)

FURTHER READINGS

- Allen, Nellie B , *United States*, Ginn and Company, 1925 Pp. 111-125
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- Huntington, Ellsworth, Williams, Frank E, and van Valkenburg, S, *Economic and Social Geography*, John Wiley and Sons, 1933 Wheat and the relation of temperature to agriculture Pp 74-90 Difficult reading for high school students but an excellent aid to the teacher
- Smith, J Russell, *North America*, Harcourt, Brace and Company, 1925 Pp 339-365
- Stull, DeForest, and Hatch, Roy W , *Our World Today*, Allyn and Bacon, 1932 Pp 32-33; 518-520.

A world-wide practice In practically all of the agricultural areas of the world, horticulture—the growing of fruits and vegetables—is practiced to some extent. Yet the United States and small sections of western Europe are the only places where the masses of the people have access to a great variety of fruits and vegetables. This is especially true of the juicy fruits and of the leafy vegetables.

In large parts of the tropics, vegetables are difficult to grow because of the ravages of insect pests which prey upon the seeds as soon as they are planted, or upon the plants almost the minute they begin to grow. In certain densely populated portions of the world the farmer must give his land to food crops that yield more calories (heat and energy) per acre than can be obtained from juicy fruits and leafy vegetables. At the same time, hundreds of millions of peoples are in deepest ignorance of good dietary practices and do not understand the value of certain vitamins contained in fruits and vegetables.

This necessity of giving the land to foods that yield calories, together with deepest ignorance of a balanced diet, causes the masses of the people of India, Russia, southwest Asia, the East Indies, and many parts of Latin America to do without leafy vegetables or juicy fruits. If they consume vegetables or fruits at all they are of the starchy type. Within most parts of the United States, however, the need for fruits and vegetables is emphasized. These products may be grown in great variety with relative ease, and they may be obtained cheaply and easily (either fresh or canned) by the masses of the people at all times of the year—both in season and out of season. While, therefore, the practice of horticulture is world-wide, the degree of emphasis given to this industry varies widely from one part of the world to another.

FRUIT CULTURE IN THE UNITED STATES

Importance. The United States stands first among the countries of the world in the production of both deciduous fruits, such as apples, peaches, pears, and plums, and citrus fruits, such as oranges,

lemons, grapefruit, tangerines. This country also leads in the importation of tropical fruits. The value of our fruit crop normally exceeds \$500,000,000 annually, and at the same time our imports of fruit each year are worth many millions of dollars.

A complex industry. The fruit culture of the United States is a complex industry, in which human ingenuity and skill play an important role. Famous horticulturists, such as Luther Burbank, have had far-reaching influences upon the fruit industry; but their efforts would have been valueless without the proper environment in which to work. It is of interest here to note that Burbank did most of the work for which he is famed, in southern California, the most important fruit area of the entire world.

Although the human element is important, the proper geographic environment, either natural or man-made, is absolutely essential to fruit culture. Bananas can only be grown in a warm, moist region. Their production, accordingly, is limited either to the tropics or to a man-controlled climate—that of the greenhouse. In a similar manner, each fruit and vegetable requires certain environmental conditions in order to do well. The profitable development of horticulture not only requires a suitable natural environment, but it also requires proper cultural environment. A given area may possess ideal climate and soil conditions for the cultivation of oranges, but if there is no market for the crop, orange culture cannot be carried on with profit. The purpose of this chapter is to explain some of the outstanding relationships which exist between the geographic environment and the profitable production of fruits and vegetables.

Critical geographic factors of fruit culture. In spite of the fact that fruit production is widely scattered throughout the United States, each fruit has its own specific geographic conditions under which it thrives best. Since the orange, lemon, and grapefruit can stand but little frost, their cultivation is confined to the southern part of the United States. The olive and fig require but little water and need an abundance of heat and sunshine; consequently their production is limited to the drier portions of southwestern United States. Even the apple, one of the most hardy of fruits, cannot stand unseasonable (late spring) frosts. As a result, all of the major apple-growing areas are situated in places that have a degree of protection against this particular weather hazard.

In a similar manner, fruit production must be adapted to other geographic conditions. In some areas insect pests and disease germs

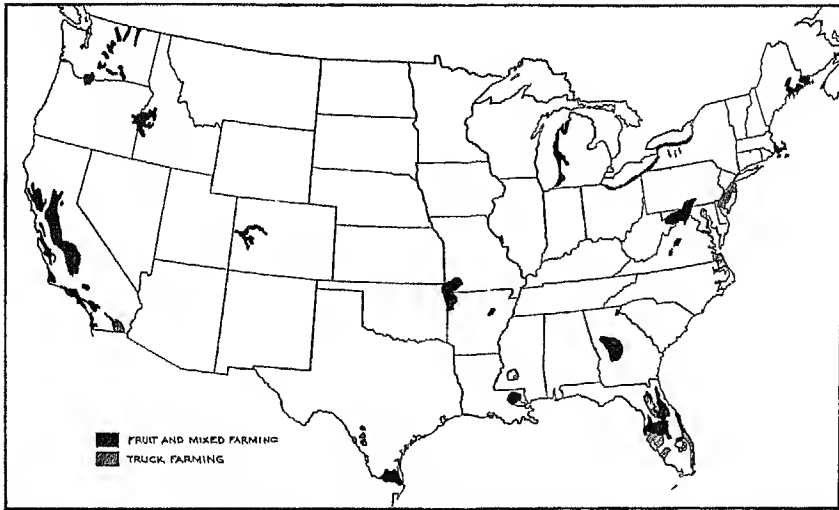
are a constant threat both to the fruit and to the tree. In general the most critical geographic factors influencing fruit production are: (1) unseasonable frosts, (2) insect pests and disease germs, (3) droughts, and (4) extremely cold winters. Soils suited to fruit production are widespread. Yet in a few areas, as in southern Florida, the soils may be too sandy and infertile or too swampy for fruit production, until they have been fertilized or artificially drained, as the case may require.

Untimely or unseasonable frosts. Any frost that occurs at a time to kill or greatly injure the fruit or vegetable crop is termed by the horticulturists an *untimely* or *unseasonable* frost. In some fruit sections of the United States any and all frosts are considered unseasonable. For example, the lemon crop cannot stand frost. As a result, the lemon groves of southern California are located in areas that seldom experience freezing temperatures. If, therefore, during some exceptionally cold winter, frost occurs in these areas, such frosts are considered unseasonable. Similarly, the southern third of Florida is practically frost-free. Any frost that occurs in this area is likely to catch vegetable and fruit producers unprepared.

In most parts of the United States the late spring frost is the one most dreaded. Yet the early fall frost occasionally does a vast amount of damage. The exact date of an untimely frost depends upon the location and the weather that has preceded it. In Georgia, early March may be warm enough to cause peach trees to bloom. After such a period a late March frost will damage or perhaps kill the peach crop. In Ohio, on the other hand, late March or early April may be warm enough to start the fruit, only to have it killed by a late April or early May frost. During certain years, late April freezes have occurred at Cincinnati, Ohio, without doing much damage. During other years, even light frosts at such a time have killed most of the fruit crop within the area. In the light of the preceding discussion, can you explain this difference in the results of late April freezes in Ohio?

PROTECTION FROM UNSEASONABLE FROSTS

Bodies of water. Some of the finest fruit areas of the United States are given a large measure of protection from untimely frosts by bodies of water. This principle can be simply explained by use of the Michigan Fruit Belt. (Illus., p. 162.) First it must be under-

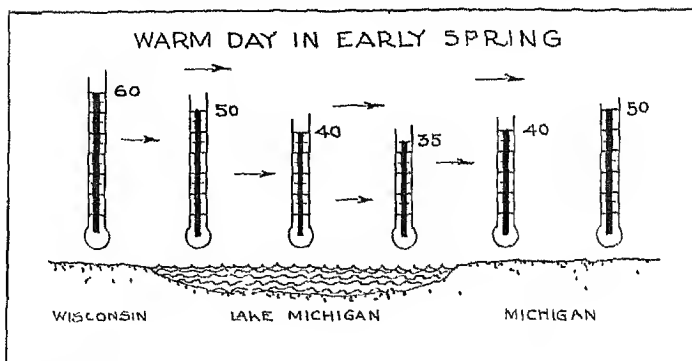


The major fruit, mixed farming, and truck farming regions of the United States (Courtesy U S Dept of Agriculture)

stood that the temperature of land is more easily changed than that of water. That is, land heats more quickly than water and also cools more quickly than water. With this fact in mind, let us see why the western part of Michigan is well suited for fruit culture.

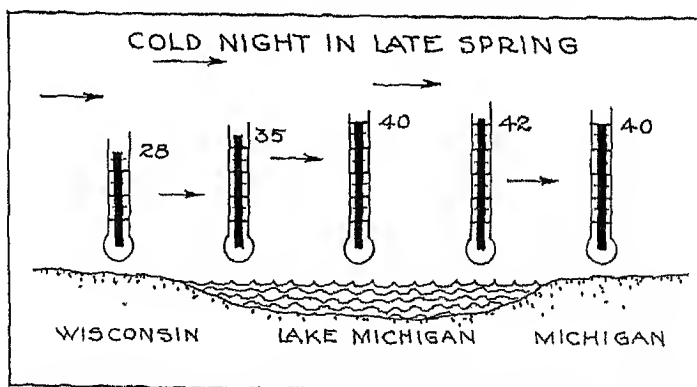
With the first warm days of spring the sandy soil of Michigan heats rapidly, but the water of Lake Michigan remains cool. The temperatures are somewhat as indicated in the top illustration on page 162. Wisconsin becomes warm, and fruit trees bloom. As the westerly winds blow across the cold waters of Lake Michigan, the air temperatures continue to fall until they reach land once more. These cold winds cool the western border of the State of Michigan and prevent the trees from putting forth blooms and fruit. By the time the air has reached the central part of the state of Michigan it has become warm once more, causing the fruit trees to bloom. Thus in the early spring, when the first warm days cause the fruit trees of Wisconsin and central Michigan to put forth fruit, the Michigan Fruit Belt is still bathed with cold winds from the lake, and the blooms are thereby delayed. Study the illustrations on page 162 carefully.

Later, cold weather returns with northerly or westerly winds from the cold part of the continent. Now the land cools more rapidly than water. (Lower illus.) The winds from the Dakotas and Nebraska



Fruit trees bloom earlier in Wisconsin than in the Fruit Belt of Michigan

early frost to the western shore of Lake Michigan. Although the water may still be cold, it is warmer than when the first warm days arrived, a month or possibly six weeks earlier. Even then the water was not freezing. Consequently, the cold air from Wisconsin is warmed to approximately the temperature of the lake before it reaches the State of Michigan. As the air passes over the Fruit Belt, it still retains the warmth secured from the lake. Even if the fruit trees of the Michigan Fruit Belt have by this time put forth blooms and fruit, the crop is not injured. As the air passes inland over the cold land, it is once more chilled to the point where it kills the fruit (already in bloom) in the central part of the state. Thus, the lake serves a double purpose: (1) It keeps the Michigan Fruit Belt cool



Cold spells in late spring may kill the Wisconsin fruit crop, but do no damage to the fruit of western Michigan

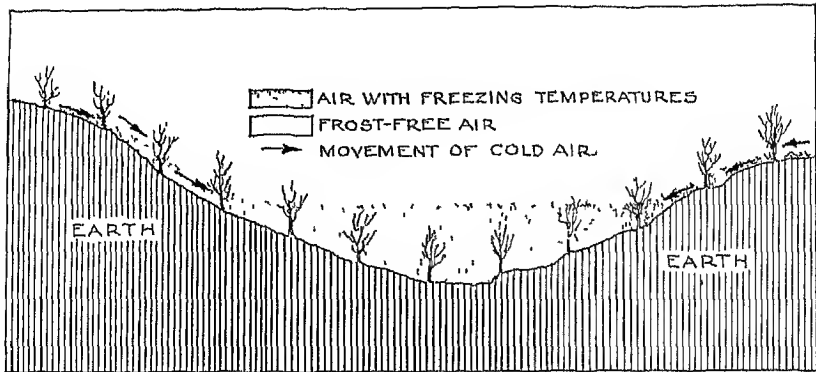
during the first warm days of spring, thereby preventing the early budding of the trees, and (2) when late frosts occur in Wisconsin and central Michigan, the lake keeps the Fruit Belt frost-free.

This natural protection against unseasonable frosts has enabled the horticulturists of western Michigan to develop one of the most important fruit-growing industries of eastern United States. This region is the most important cherry-growing district in the country, and is well known for its bountiful crops of apples, peaches, and pears.

Application of principles to other regions. A study of the horticultural regions of the United States reveals that the southern shores of Lake Erie and Lake Ontario and the lands bordering the Finger Lakes District of New York—all protected by water—are noted for their fruit and vegetable culture. The great fruit areas of the Pacific Coast Region lie in the westerly wind belt during the winter months and are given a large measure of protection by the warm waters of the Pacific Ocean.

Protection by air drainage. In most parts of the United States the orchards receive some protection against destructive frosts because of *air drainage*. To understand the simple principle of air drainage and its relation to fruit production it is necessary to know three facts; namely, (1) that land cools more rapidly than air, (2) that cold air is heavier than warm air, and (3) that the unseasonable frost—for example, the late April frost in Ohio—lasts but a few hours during the coldest part of the day. Usually these late frosts occur sometime between midnight and morning. Then, when the sun rises, the atmosphere is quickly warmed above the freezing point.

With these three facts well in mind, let us see how air drainage may save a fruit crop. Assume that near Cincinnati the first part of April has been warm, and the fruit trees are in full bloom. The crop is accordingly in excellent condition to be destroyed by frost. Let us further assume that about April 25 a cold night is forecast, causing fear that the fruit crop will be killed. Under such conditions, how may air drainage save certain parts of the fruit crop within the region? During the night the temperature falls and the land cools more rapidly than the air, as stated above. The air near the earth's surface is chilled by the land and becomes heavy. If this air is on a hillside it flows, because of its weight, down into the valley. This process continues for hours, until the cold air of the valley reaches the blooms and fruit, killing them. (Illus., p. 164.) If



An unseasonable frost may destroy the fruit crop of the valley, and, at the same time, leave unharmed the fruit crop of neighboring slopes

this process were to continue long enough, the valley would be filled to overflowing and the hills would be covered with cold air. Under such conditions, all of the fruit would be killed. If, as happens with many unseasonable cold spells, the air warms up within a few hours, the hillside fruit may not be injured. Study this illustration carefully in light of the three facts needed for the understanding of air drainage.

A study of the major fruit-growing areas of the United States indicates that air drainage is of value to the fruit-grower in practically all parts of the country. Air drainage is of great value to the horticulturists of the Appalachian Apple Belt which extends from southern Pennsylvania south into North Carolina; and of the Ozark Fruit Belt (apple and peach area) which extends from Arkansas to southern Indiana. Air drainage also gives a large measure of protection to the citrus fruit crop of northern Florida and to the lemon crop of southern California.

Protection by mountains. The most important apple-growing district of the entire world is located just east of the Cascade Mountains in central Washington and Oregon. The Yakima, Wenatchee, Okanogan, and Hood river valleys are almost ideal for apple culture. Here, normally, is grown more than one-fourth of the apple crop of the United States. The fertile soil, abundant sunshine, plentiful supply of irrigation waters, and the relative freedom of the desert areas from diseases and insect pests all favor apple culture. In addition, as a result of the protection given by the mountains, the apple crop is relatively reliable.

The snowfall of the Cascades is heavy, and large portions of the slopes are covered with snow until late spring or early summer. The westerly winds blowing over these mountains carry their chilly temperatures into the valley below. Consequently, when the first warm days of spring cause the fruit trees to bloom in most sections of northwestern United States, the apple-growing areas which lie near the foot of the mountains and close to the snow fields are kept too cool for blooms and fruit. When tardy freezes occur, later, the fruit of the blooming trees is killed, whereas that of the mountain valleys, being less developed, remains ununjured. When, finally, the snow has retreated far up the mountainsides, and the weather has become warm enough for the trees in the valleys to bloom and to put forth fruit, it is, then, too late in the spring for the occurrence of any more unseasonable frosts. Some of the fruit districts lying east of the Rocky Mountains and probably some of the orchards lying east of the Appalachian Mountains are given a certain amount of protection in this same manner.

Protection by artificial heating. In southern California, central Florida, and the Gulf Coast, frosts rarely occur. Even when freezing temperatures are experienced, they last but a few hours during the coldest part of the night and early morning. Under such conditions



Oil-burning orchard heaters keep California orange trees and their fruit from frost injury on cold winter nights (Courtesy California Fruit Growers Exchange.)

it may be profitable to protect valuable crops such as oranges and lemons by artificially heating the orchards. In California, where the great petroleum fields have resulted in a cheap supply of oil, many orange and lemon groves are protected during the cold hours of the night by oil heaters. In Florida and parts of the Gulf Coast such heaters are also used, but to a lesser extent.

Insects, pests, and diseases as related to fruit culture. Next to unseasonable frosts, insects and diseases are the fruit-grower's worst enemies. No part of the country is immune from the ravages of these foes. At times the orchards may be so badly infected with insects or diseases that the fruit crop may be completely ruined and even the trees may be killed. At other times, even though the crop is not destroyed, it may be necessary to quarantine large infected areas in order to prevent the spread of insects or diseases. Under such conditions the fruit-growers, prevented by law from shipping their products to market, may lose many millions of dollars.

Fortunately, diseases and insects are subject to human control. This is frequently accomplished by spraying the blooms, fruit or trees with poison which kills the diseases without rendering the fruit unsuited to human use. In some areas it is necessary to spray the orchards once or twice every year; in other areas the spray is used only when there are distinct indications that such action is needed. As a general rule, the greater the heat and humidity of a region, the greater it suffers from these arch enemies of man, unless some remedial measures are taken. Thus, insects and diseases are easily controlled in the apple orchards of the arid portions of Washington. They are much more difficult to combat in orchards of the hot, humid areas of the Cotton Belt.

Cold winters and drought as related to fruit culture. Large areas of the semiarid and arid regions of the United States are too dry for the production of fruit without the aid of irrigation. This is the case in most of the Great Plains and in practically all of the Great Basin—land lying between the Rocky Mountains and the Sierra-Cascade Mountains. Occasionally droughts injure the fruit crops in eastern United States, but east of the Mississippi River such damage is small compared with that caused by unseasonable frosts, diseases, and insect pests.

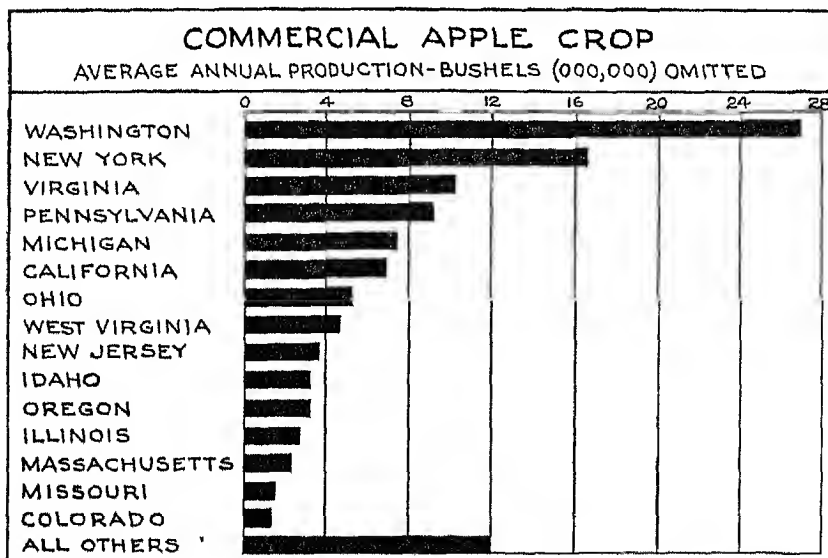
Few fruit trees can stand winter temperatures lower than 20 degrees below zero. Thus, the cold winters of Wyoming, Montana, North Dakota, South Dakota, Minnesota, and Wisconsin are sufficient

in themselves to prevent these states from being large producers of a wide variety of fruits. Certain varieties of hardy apples, and a few species of hardy peaches, together with minor fruits and berries, make up the major fruit crops of these states.

APPLES

America's most valuable fruit. The apple seems to be America's favorite fruit. It is more valuable, occupies a larger acreage, and is more widely distributed than any other of our fruits. The average annual crop of the United States is approximately 180,000,000 bushels. The average value for the five-year period, 1931-1935, is estimated at \$130,000,000. As compared with our staple crops, such as corn, wheat, cotton, and hay, the value is small, when compared with other fruit crops, it is large.

Distribution. Apples are grown in every state in the Union and on nearly one-half of the farms. These facts might lead one to believe that the apple tree bears well in all parts of the United States. Such, however, is not the case. Approximately 60 per cent of the apples are grown without giving much thought to the hazards of production, such as unseasonable frost, insect pests, diseases, and drought. This portion of the crop is unreliable, and in many cases



Why are some states better suited to apple culture than others? Data for 1934-41.

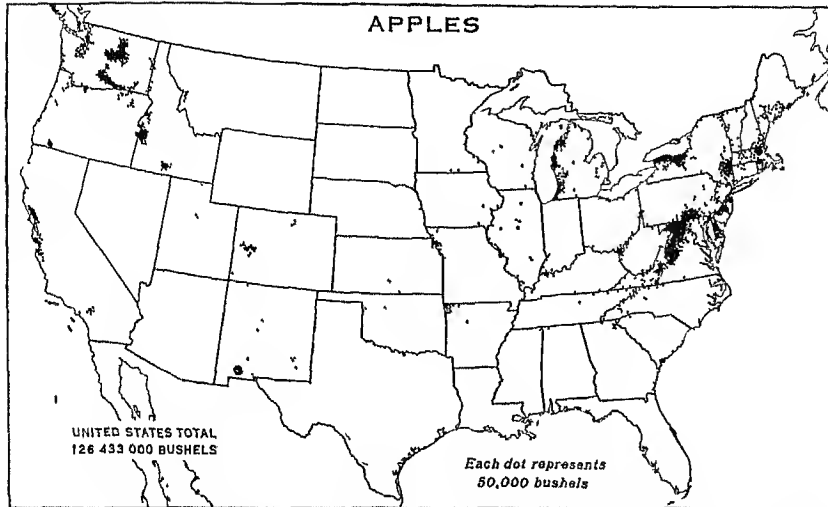
the fruit is of inferior quality. The loss from frost ranges from 6 per cent to almost 60 per cent a year. In addition, the losses from insects, diseases, cold winters, and other crop hazards are large.

In 1921, more than half of the entire apple crop of the United States was killed by unseasonable frost. In some places the loss was complete; in other places it was small. Missouri, Iowa, Kansas, and Nebraska, with but little protection from frost, had less than one-tenth of a normal crop. In Virginia the late spring freeze of that year was so severe and of such long duration that air drainage afforded but little protection, and the crop was only 5 per cent of normal. In the Great Lakes districts and in the Pacific Coast areas the crop was but little damaged, while in the Columbia Valley (Yakima, Wenatchee, and other apple-growing valleys of the Cascade Mountains) the crop was excellent.

This reliability of fruit production of some areas and unreliability of others might be illustrated with each of the hazards of crop production, but space does not permit. The farmers recognize that in most parts of the United States there is danger of fruit-crop failure because of adverse weather conditions, diseases, or insect pests. However, since the land is not needed for other crops, and since at least 60 per cent of the orchards are given but little care, the farmer is willing to take a chance that the benefits derived from these but-little-tended orchards will exceed the losses. Some years the crop is good, other years it fails. It is a gambler's chance and the farmer takes it.

This possibility of a good crop results in apples being grown in areas where failures are frequent. Thus apples are grown in North Dakota and in Florida, although the climates of both states are ill-suited to the crop. The cold winters of North Dakota may kill not only the fruit, but also the trees; whereas the warm, moist climate of Florida is well suited to insect pests and diseases which prey upon the orchards. This indiscriminate location of apple orchards results in the fact that crop production is exceedingly unreliable in at least 60 per cent of the orchards.

Commercial apple production. Those who make apple culture a business are not satisfied with haphazard methods of production, nor with the uncertainty of the crop which prevails in most parts of the United States. The commercial crop is grown, for the most part, in those areas where the crop is relatively reliable and where the fruit



Note carefully the location of five or six of the major apple-producing regions of the United States and explain how each one is given some protection from unseasonable frosts. (Courtesy U. S. Bureau of Agricultural Economics)

is of good quality. Conditions for such production occur in areas widely scattered from the Pacific Coast to the Atlantic Seaboard. (Illus., above.) In general, the locations may be classified as follows: (1) situations near the Great Lakes, especially in New York, that are given a degree of protection by these bodies of water; (2) situations on rugged or rolling topography where air drainage gives some protection against unseasonable frost, (3) situations near the Pacific Coast where the winter winds are tempered by the ocean, (4) situations close to the Atlantic Coast where cool spring winds retard the blooming of the trees and thereby give some protection; and (5) situations protected by mountains. In addition, fertile soils, an abundance of sunshine, and proper distribution of water favor production. Point out the most important commercial apple-growing areas and indicate the way or ways in which each region is given a degree of protection against unseasonable frosts.

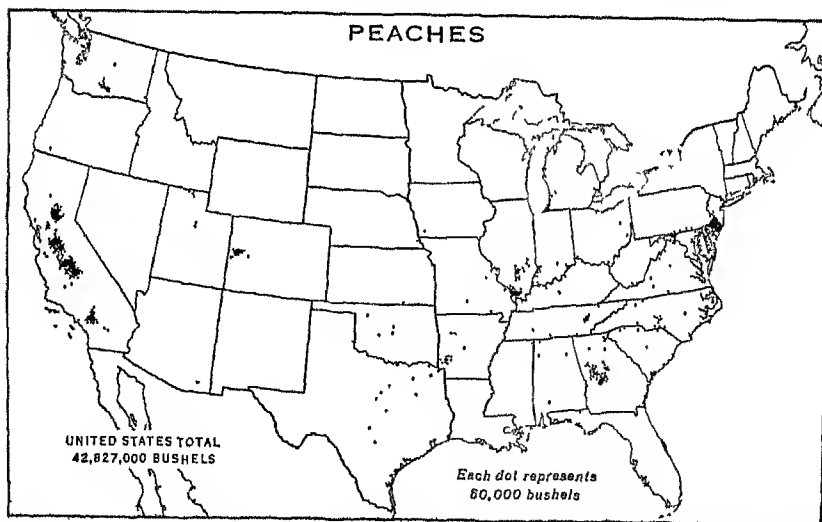
There are three large areas within the United States that are conspicuous for their lack of commercial apple culture. In the first of these, the northern portion of the Great Plains, the severe winters sometimes kill both the fruit and the trees. The second area, the South, is too warm and moist for profitable apple culture.

Moreover, insects and diseases are difficult to control in the South. The third area, the southern portion of the Great Basin, is too hot and dry for orchards, except under irrigation.

OTHER FRUITS

Peach production. The peach trees and fruit are less hardy than the apple trees and fruit. As a result, peach culture has prospered only in regions with mild winters or in situations protected from unseasonable frost. Central California, tempered by the winds from the Pacific Ocean, is the greatest peach-growing region in the world. The hill-land of north-central Georgia, with its mild winters and excellent air drainage, is the second greatest peach-growing region of the United States. Most of the other peach districts of this country are situated in areas having mild winters and excellent air drainage, as in the Ozark Mountains of Arkansas and in southern Illinois, or in areas protected by water, as in the lake-shore areas of Michigan and New York.

Marketing peaches. Fresh peaches are relatively perishable and as a result cannot stand long delays in shipment and marketing without considerable risk of deterioration. In order to prevent such losses, and also in order to make the peaches available at



Most of the commercial peach crop of the United States is grown in areas having mild winters or in situations where the orchards are protected from unseasonable frosts. (Courtesy U. S. Bureau of Agricultural Economics.)

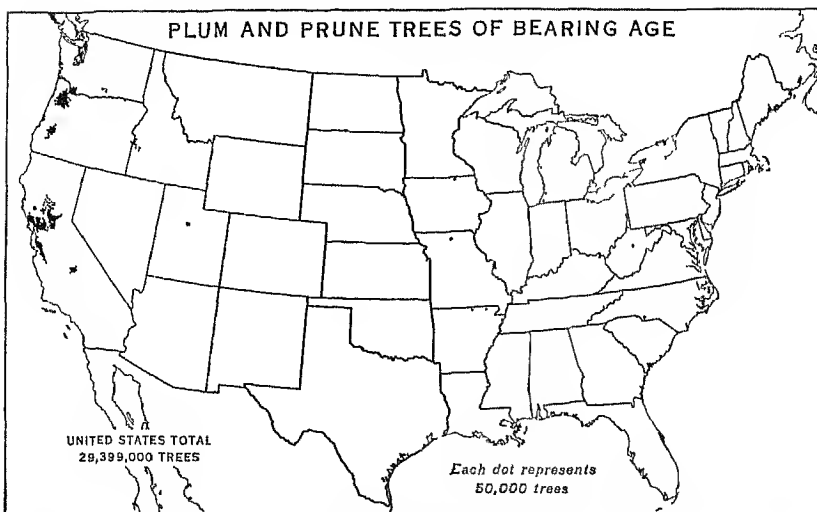


Drying apricots in sunny California, where the climate is ideally suited for drying apricots, prunes, and raisins

all seasons of the year, millions of bushels are canned or dried annually. California leads in both of these industries. That state produces fine grades of clings rich in flavor and color and, consequently, excellent for the canning industry. The freestone peach is canned in the home but seldom in the factory. The freestone has an unsightly center when taken from the pit. The cling, being cut from the pit, has a smooth and nice-appearing center. The long, hot, dry summer and fall weather are well suited to the drying industry.

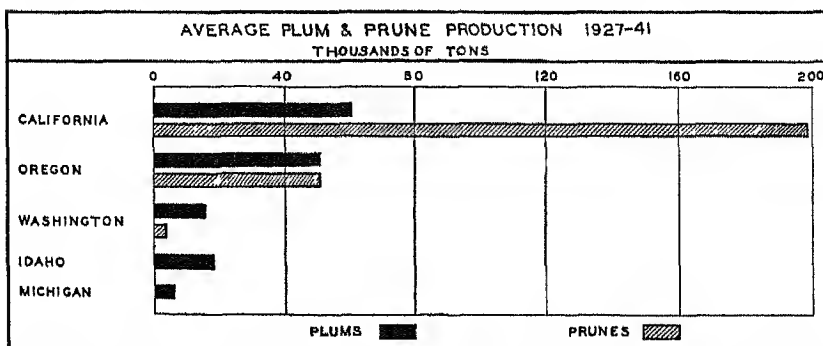
Apricot production. The apricot closely resembles the peach in its physical appearance, but it is more sensitive to frost. The American production of this wholesome fruit is confined almost exclusively to southern California. Here the rare occurrence of frost favors the production of bountiful crops, whereas the abundance of sunshine makes it possible to dry the fruit with ease. The fruit may be marketed either fresh or dried, but the latter is preferable for remote markets. Fresh apricots spoil quickly; whereas the dried product will keep for an indefinite period.

Plums and prunes. The plum, like the peach, cannot stand severe winters and is easily destroyed by unseasonable frosts. In order to avoid this hazard, most of the nation's supply is grown in two states,



Why are California and Oregon especially well suited to plum culture? (Courtesy U. S. Bureau of Agricultural Economics)

California and Oregon California leads in the production of both crops, and is, indeed, the greatest prune-producing area in the world. In California the long, hot, dry summer weather permits the drying of the prunes in the sun; but the cloudy, damp, drizzly weather of Oregon and Washington requires that the prunes of those states be dried artificially, or, if dried in the sun, that great care be taken to shelter them from frequent rains during the dry period. Since the fresh plums are perishable, and since these



Most of the California plum crop is dried; whereas, the plum crop of Idaho and Michigan is consumed fresh or canned. Can you give two reasons why such a large percentage of the California crop is dried?

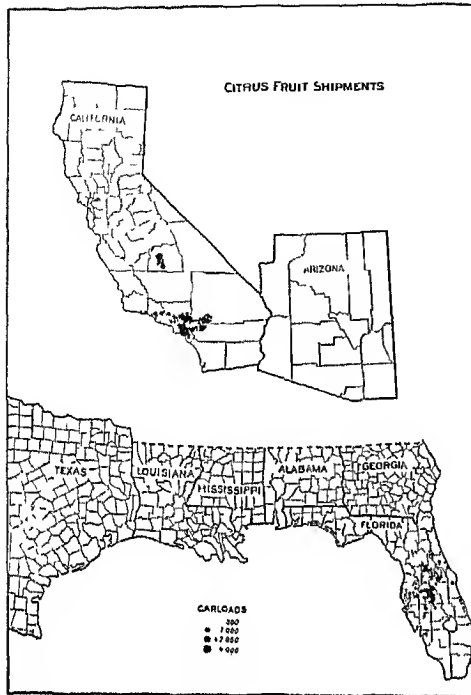
western states are a long distance from the great American market, most of the California and Oregon crop is either dried or canned.

Citrus fruits. Oranges, grapefruit, lemons, tangerines, and limes are known as citrus fruits. They are all tropical or subtropical products, sensitive to frost, and are grown in areas of mild winters (Illus., p. 174). Most of the citrus fruits of semitropical America are grown in California and Florida. A large area stretching along the Gulf coast from Florida to Mexico is suited to these fruits, but only a small portion of this land is at present under cultivation.

For more than a decade after 1875, when the East Coast Railroad of Florida was completed, Florida dominated the orange market of eastern United States. Later, several factors combined to give California a leading position, which has been retained up to the present time. The severe freezes which covered large portions of Florida in 1894 and again in 1899, together with disheartening losses of citrus crops as a result of the ravages of insects and diseases, resulted in serious setbacks to the fruit culture of the state. At the same time the rapid improvement in the methods of transportation, and especially the introduction and use of the refrigerator car, invented in 1884, permitted California to deliver her fruit to eastern markets cheaply and in good condition. Then, too, the successful efforts of the great horticulturist, Luther Burbank, to improve the quality of the California orange was a material aid to that state.

Florida's fruit-growers still suffer serious losses from time to time as a result of insects, diseases, and unseasonable frosts. In 1929, the prevalence of the Mediterranean fruit fly in Florida caused the Federal Government to stop shipment of fruit from 75 per cent of the orange-grove acreage of the state. In 1934, millions of dollars worth of oranges were destroyed by frost, and in some areas even the trees were killed. In spite of these handicaps, Florida's fruit production is increasing each decade. The state lies close to the eastern market, has an abundance of relatively cheap land, and plenty of rainfall—factors which offset the disadvantages under which the fruit-growers labor.

California is especially noted for its production of the navel orange. This large, seedless, and richly colored fruit of excellent flavor has been an important factor in placing California in her present dominant position as an orange-producing state. California, like Florida, suffers occasionally from frost, but many of the orchards are equipped with oil-burning smudge stoves which may be used to



The citrus fruit crop of the United States is almost completely confined to the relatively frost-free sections of Florida and California. (Courtesy U. S. Dept. of Agriculture.)

raise the temperature of the air several degrees. Since the rainfall is light, irrigation is necessary to supply the needed moisture for the orange crop. The demand for water in southwestern California has increased to such an extent that a sufficient supply is difficult to obtain, and it has become expensive. At the same time the price of land is high. This situation has been caused by the rapidly increasing population of southern California and the resultant demand for land as homesites and for the production of winter vegetables, nuts, fruits, alfalfa, and many other crops. As a consequence, the cost of orange production is increasing, and the seedless

navel orange of California is meeting increasing competition from the seed-containing but juicy Florida and Gulf Coast product.

Grapes and raisins. The grape culture of the United States is highly concentrated within a few small districts. Approximately 80 per cent of the commercial crop is grown in California. Most of the remainder is grown along the southern borders of the Great Lakes or in the Finger Lakes District of New York. However, some grapes, mostly for home consumption, are grown in widely scattered sections of eastern United States.

California grape industry. California leads all other states of the Union in the production of table grapes, wine grapes, and raisin grapes. The Sacramento River Valley is famous for its production of large table grapes of excellent quality. Through modern methods of storage, fresh California grapes are available during most months



Picking strawberries in California, the greatest strawberry-producing state in this country. (Courtesy Southern Pacific Company)

of the year. Since wine is a product that will keep indefinitely, California wine—bottled sunshine, as it is sometimes called—is available at all seasons

The most important grape industry of California is that associated with the raisin industry. Raisins are made by drying certain varieties of grapes. The most important raisin-producing center in the world is the one located near Fresno, California. Conditions near Fresno are almost ideal for the raisin industry. Large areas of fertile, level land are well suited to irrigation, the snows of the Sierra Nevada Mountains melt at just the right time to supply the grape crops with their needed moisture; and the harvest period is exceedingly hot and dry, resulting in the most favorable conditions for curing the raisins. California raisins—Sun Maid raisins—are sold all over the world.

Berries. California is as well suited to the production of berries as to fruits. Strawberries, blackberries, and raspberries all do well in certain parts of the state. California is the largest strawberry producing state in the Union (illus. above.) Because of the

perishable nature of berries and the long distance to eastern markets, a large part of the crop is canned locally.

VEGETABLE INDUSTRY

Farm gardens. Nearly every farm has a garden. Usually it is only a small plot of land, but it is intensively cultivated, well fertilized, and frequently watered, even in the humid portions of the United States. In most cases the garden is the most productive land on the farm. On this small patch of land—usually less than an acre—a surprisingly large percentage of the food supply of the family is grown. The garden is not restricted to the farm. Many vegetable gardens are cultivated in small towns, enabling retired farmers and common laborers to live throughout the year on a remarkably low income.

Market gardens. In the United States all of the larger cities and many of the smaller ones are supplied with fresh garden vegetables every day. This task is performed by the market gardener and truck farmer. *Market gardening* is an industry carried on in the vicinity of cities in order to supply vegetables to the market with the minimum of cost and effort. Vegetables deteriorate rapidly, are relatively bulky, and must be handled with speed and care if they are to reach the consumer in a good state of preservation. These facts account for the desire of the gardener to locate close to the populous part of the city. However, city and suburban land is expensive, sometimes selling for more than \$1,000 an acre without improvements. If covered with greenhouses, it may be worth \$10,000 an acre or more. Such land, in order to be profitable, must produce large yields of high-priced crops. Sometimes several hundred dollars worth of work, at ordinary wages, is put on a single acre of garden land each year. As a city grows, the market gardens push ordinary farm crops, and even the dairy industry, off the fertile farm land that lies close to the city.

Truck farms. Only part of the vegetable supply which reaches large cities, such as New York, Philadelphia, and Chicago, is grown locally. Some of it is produced by truck farmers who live scores, hundreds, or even thousands of miles distant. Three factors work together to make this practice possible and profitable. (1) Excellent and rapid transportation facilities, together with improved methods of ventilation and refrigeration, have simplified the task of shipping



A bountiful crop of beans grown in the Everglades. The crop is being harvested in mid-winter when prices are high. (Courtesy Florida Agr. Exp. Station.)

fresh vegetables long distances by highway, railway, and water.

(2) The truck farmer may be able, by going long distances from the city, to select soil, climate, or other physical conditions well suited to particular needs. (3) The price of land and of labor are likely to be lower in rural areas than in the neighborhood of large cities. For example, the market gardeners of New York, Philadelphia, Chicago, and other large cities of northern United States cannot grow vegetables during the winter months except in expensive greenhouses. Consequently, during this period the truck farmers of Florida, California, and Texas find it profitable to help supply this large city market.

Growth of gardening industry. The consumption of fresh vegetables, especially green vegetables, has increased rapidly during the last fifteen years. This rapid increase is due to the following combination of economic and social factors. (1) During recent years much study has been given to dietetics, and it has been found that leafy vegetables are rich in certain vitamins needed by the human body. (2) This knowledge has been widely spread among the American people. (3) Improvements in methods of transportation and refrigeration have enabled truck farmers to search out the best places for the production of various kinds of vegetables. (4) Improvement in

methods of canning have enabled the American people to reduce the highly perishable product to a nonperishable form, and at the same time to preserve the excellent flavor and food value. Thus the masses of the people now find it feasible to have fresh vegetables both in and out of season, or they may eat canned vegetables brought from every part of this great nation and in some cases from remote parts of the world.

Major truck-gardening areas. Nearly 75 per cent of the urban population of the United States is located in the northeastern quarter of the country. It is only natural, therefore, that the most important summer truck-garden districts should be in this area. Although they are widely scattered, there are a few which stand out because of their importance. Foremost among them is the Middle Atlantic Coastal Truck-gardening Belt extending from Chesapeake Bay to the northern coast of New Jersey, well situated to supply the coastal cities with fresh vegetables every day. Next in importance are the truck-garden areas situated along the south shores of Lake Erie and Lake Ontario and along the east shore of Lake Michigan. The most important winter truck-farming areas are situated in California, Florida, and Texas.

California the ideal truck-garden state. The greatest vegetable-producing region of the United States, and perhaps of the world, is situated in southern California. The region has mild winters, the precipitation comes mostly in the winter months, the soil is fertile, and large areas are irrigated. Normally, California grows one-fifth of the commercial vegetable crop of the United States. It grows more than one-half of the nation's asparagus, cantaloupes, and lettuce, and is also a large producer of string beans, cauliflower, celery, green peas, spinach, watermelons, and a great variety of other vegetables.

Southern coast of California. The coastal belt of southern California has developed the most intensive agriculture of any major district of the United States. Los Angeles County ranks first among all counties of the nation, both in the total value of farm produce, and in the value of crops per acre. This dominant position is a result of intensive fruit, nut, and vegetable cultivation in a region well suited to these products. It is also, in part, a result of the fact that these perishable products are thrown on a national market during the winter months when the prices are high.

The truck and market gardens of this area are greatly favored by a long growing season which lasts from 10 to 12 months each year, and



Because of irrigation, this land in Imperial Valley, California, will now produce bountiful crops of cantaloupes and vegetables for eastern markets

by irrigation which permits several crops to be grown annually. During the winter months the warm, moist winds from the Pacific Ocean are especially favorable for the rapid growth of leafy vegetables, such as celery, lettuce, and asparagus. During the last 10 years, 5,000 to 10,000 carloads of lettuce were shipped from California annually.

The Imperial Valley. The Imperial Valley, sometimes known as the "American Egypt," is today one of the great truck-garden spots of the nation. (Locate the Imperial Valley in the illustration on page 188.) It is frost-free, and consequently green vegetables can be thrown on the market during the coldest winter months. The soil is fertile and the temperatures are high. Such conditions, together with a plentiful supply of irrigation waters, are ideally suited to the production of bountiful crops. (Illus. above.) During December and January hundreds of carloads of lettuce are shipped from this fertile valley to eastern markets each week. The Imperial Valley is perhaps best known for its production of cantaloupes. During late May and early June it is not uncommon for one or more trainloads of melons to be shipped out of the Imperial Valley each hour of the day.



Saw grass of the Everglades in bloom. When this land is drained it makes excellent farm land. (Courtesy Florida Agr. Exp. Station.)

Florida and the Gulf Coast. Southern Florida has an extensive area of swamp land, the Everglades, parts of which have been drained and turned into productive truck farms. (Compare the illustration at the top of the page with the one on page 177.) The land is fertile and the rainfall is well distributed. Part of the area is entirely frost-free, and other parts are visited by frosts on occasional years when cold northern winds carry freezing temperatures almost to the southern tip of the state.

During December, on a short drive through the farming district south of Lake Okeechobee, one may see thousands of men pushing hand plows or in other ways tending large fields of beans, lettuce, celery, peppers, and a variety of other vegetables.

The truck farmers of this region send their products to market during the winter and early spring months, when the price is high. The only other fresh vegetables that reach the market at this time of the year are those shipped in from southern California, Mexico, and the West Indies, or those expensively grown in greenhouses.

In April the vegetables grown in northern Florida and in the irrigated lands of southeastern Texas begin to reach the market, by June the vegetable industry is in full swing all along the Middle Atlantic Seaboard and in the interior of the United States.

Middle Atlantic coastal area. During the summer months the greatest vegetable-producing centers of the United States are found

along the Middle Atlantic Coast and in lakeshore areas, especially south of Lake Erie and east of Lake Michigan. Most of these areas have warm sandy or loamy soils that are easily tilled, the spring and summer rainfall is plentiful and well distributed, and large markets are near by. In some of the most important market-garden districts the soils are relatively infertile. However, because of the other natural advantages, the gardeners can afford to utilize large quantities of commercial fertilizers.

Conclusion. The foregoing study of the horticultural industries indicates clearly that the United States is suited to the production of an abundant supply of all kinds of temperate and subtropical fruits and vegetables. Our great variety of climates favors the production of almost every kind of fruit and vegetable except those which are strictly tropical. Our excellent transportation facilities permit these products to be distributed to all parts of the nation throughout the entire year. Our high standards of living enable the masses of the people to eat vegetables (either fresh or canned) almost every day of the year. And, finally, since these products are grown on home soil, there is no danger that the supply will be cut off because of high tariffs, wars, blockades, or other measures which frequently retard or stop the flow of international goods.

QUESTIONS AND EXERCISES

1. In what countries is horticulture most widely practiced? Why?
2. What are the critical geographic factors of fruit culture?
3. How has nature provided certain fruit areas with protection against unseasonable frost?
4. To what extent can man aid nature in protecting a given region from unseasonable frost?
5. What is meant by air drainage? Have you ever noticed the influence of air drainage as you have ridden through valleys or depressions?
6. How do climatic conditions retard or promote the development of insect pests and diseases?
7. To what extent do social conditions influence fruit culture?
8. What sections of the United States are best suited to fruit culture? Why?
9. What sections of the United States are least suited to fruit culture? Why?
10. What factors of the natural and cultural environment have influenced fruit culture in California?

- 11 Compare the advantages and disadvantages of Florida and California for the production of fruit
- 12 What are the major factors that determine the distribution of vegetable production within the United States?
- 13 What major changes have taken place in the distribution of vegetable production since 1880? Why?
- 14 Explain the terms *market gardening* and *truck farming*
- 15 What are the major causes of the development of the canning industry?
- 16 Discuss the major problems of the fruit and vegetable producers of Florida and California

FURTHER READINGS

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The cultural landscape of fruit-growing communities Pp. 217-236.
- Klumm, Lester Earl, Starkey, P. O., and Hall, N. F., *Introductory Economic Geography*, Harcourt, Brace and Company, 1937 Pp. 127-136
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IRRIGATION IN THE UNITED STATES

DEVELOPMENT AND IMPORTANCE OF IRRIGATION

An ancient practice. No one knows exactly when irrigation was first developed. It has had a long and important history in the Old World. Records indicate that man early made use of the waters of mountain streams in arid parts of inner Asia, and that small irrigated districts developed in the mountain foothills and on the adjacent plains. When the pastoral nomads of the desert and steppe learned to control waters and made them available for crops they devised a means of making a living that was more dependable than the occupation of grazing. Irrigation called for co-operation on the part of all those who used the waters of a given district. Moreover, it made possible densely populated areas where the people had the advantage of living close together. Thus irrigation became an important factor in the development of early civilizations.

Records indicate that areas of early civilization, such as Egypt, Babylonia (located in Mesopotamia), India, and China, had developed irrigation several thousand years ago. In Mesopotamia and Egypt irrigated areas became the seat of powerful empires.

Early irrigation in the United States. In the Southwest of the United States, the Indians used irrigation long before the Spaniards visited the region. Irrigation was practiced by the Pueblo Indians of Arizona and New Mexico. They used many small canals and ditches. The Spaniards taught the Indians of Mexico and the Southwest to build reservoirs and dams to store water for irrigation. Some of the canals and ditches constructed by the earliest settlers of our Southwest are still in use.

Importance of irrigation in the United States. The first important irrigation works were started by associations of farmers. But the large projects, such as are found in our Southwest today, came chiefly after the passing of the National Reclamation Act of 1902. It was provided in this act that a large part of the funds obtained through the sale of public lands in 16 of our states should be used

to develop irrigation. This act made it possible to construct dams, reservoirs, canals, and ditches in Arizona, California, Colorado, Idaho, Montana, Kansas, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Utah, Washington, and Wyoming. This important work is supervised by the Department of Interior, through its Reclamation Bureau.

As a result of the National Reclamation Act of 1902 many large irrigation projects have been completed in the West and millions of acres of desert land have been added to the cultivated acreage of our country. The United States now has about 27,000,000 acres under irrigation, and is surpassed only by India.

Under the Reclamation Act of 1902 settlement of land is regulated. For example, land held by one individual is limited in amounts of 10 to 160 acres. Moreover, the water users must repay the Government their part of the cost of construction of the irrigation system.

Advantages of irrigation agriculture. A number of advantages are associated with irrigation agriculture. (1) With an adequate irrigation system it is possible to apply water to growing crops at just the right time and in just the proper quantity. (2) Soils of the arid regions have generally not been robbed of important mineral plant foods as have those in the humid regions of our country. (3) In regions that are nearly rainless there are more sunshine days, and therefore more rapid development of crops. (4) In many irrigated areas several crops may be grown each year. For example, irrigation makes it possible for one to cut alfalfa as many as five times a year on the once desert lands of southern Arizona and California. The combination of these favorable factors is reflected in the greater yields per acre on irrigated land. In general, the average yield of crops grown on irrigation projects is just about twice the average yield on nonirrigated lands.

Disadvantages associated with irrigation. In the United States the arid and semiarid lands are located in the West, whereas the largest and most important markets are in the Northeast. Moreover, many of the western districts are located in out-of-the-way places. High cost of transportation is therefore a handicap in many instances. Some districts suffer because of excess alkali, while others receive too much water. By alkali soil we mean one that contains an unusual amount of soluble mineral salts, such as borate, chloride, sulphate, calcium, and bicarbonate of soda. These substances frequently collect on the surface under arid conditions and excessive evaporation.

Areas covered with crusts of alkali are called "alkali flats." In some irrigated districts alkaline substances accumulate, especially when there is not enough water to wash them out of the soil. A number of districts have been abandoned because of the excess of alkali. In other districts too much water accumulates. When a soil contains an excess of moisture it is said to be waterlogged. An excess of moisture is often experienced in irrigated valleys and basins underlain by hard subsoils through which water cannot pass. Water will therefore accumulate in the soil above this hard substance and will make the land too wet for crops. That happened in the raisin district of central California. Much land in the San Joaquin Valley that at one time grew raisin grapes is now too wet for such culture and is covered with moisture-tolerant grasses. Meanwhile the vineyards have moved onto the higher and drier lands of the valley.

Social and community life in irrigated areas. In irrigated areas farms are generally small, since irrigation calls for intensive cultivation of the land. Families live close together—in some districts in settlements that resemble villages and towns. Thus, the people benefit from the close contacts made possible by this form of community life, in which churches, schools, and recreational opportunities are available. On the other hand, in the surrounding unirrigated arid and semiarid regions the farms are frequently many miles apart.

No one knows just when irrigation was first developed in the Old World. It is certain, however, that the practice of irrigation greatly aided the development of civilization, when people learned the art of controlling the waters of the desert for purposes of crop production. Irrigation called for co-operation on the part of those who used the irrigation waters. Moreover, new ideas could be more quickly transmitted from person to person in the densely populated districts, whereas communication is poor in the surrounding expanses of desert and steppe.

Major types of irrigation. Land may be irrigated in various ways. In some areas water buckets are used to lift the water from the rivers and streams to water the adjacent lands during the dry season. In many districts along the Nile the Egyptians still follow this ancient practice. Yet large British Government projects in Egypt have made it possible for many of the peasants to employ more modern methods.

A modern method of lifting water from streams is practiced in

several of our western states. Along some parts of the Missouri River in the Dakotas, water is taken from the river by the use of pumps mounted on floating barges. These pumps are worked by electricity, the primary source of power being the cheap lignite coal of the region. This fuel has but little value, but here it serves a very useful purpose. The water is generally pumped up into a reservoir that is situated at a higher level than the crop lands. From the reservoir it is distributed to the fields by means of gravity.

Well irrigation is used in some arid regions, especially where the ground water lies near the surface of the land. In India large leather pouches or sacks that hold as much as 30 gallons of water are drawn from the wells and lifted to the surface with the aid of bullocks. Well irrigation is also used in various parts of the Great Plains, and more extensive use of it is recommended.

In some areas advantage is taken of the general slope of the country, and the water is made to irrigate as large an area as possible. For example, if a mountain stream enters a broad valley it may be diverted into a large canal which is dug at right angles to the stream in the upper part of the valley. From this canal ditches are dug to the various crop lands situated at somewhat lower levels (illus. below). This practice is employed in many of the arid valleys of western United States. But the most important modern type of irrigation is by means of dams and reservoirs. We will therefore study some of the major areas in which the large irrigation projects are situated.



Irrigation of an orange grove, Oland project, California. From canals and large ditches, smaller ditches are dug to the various crop lands. (Courtesy Bureau of Reclamation, U S Dept of Interior.)

SOME MAJOR AREAS OF IRRIGATION
AGRICULTURE

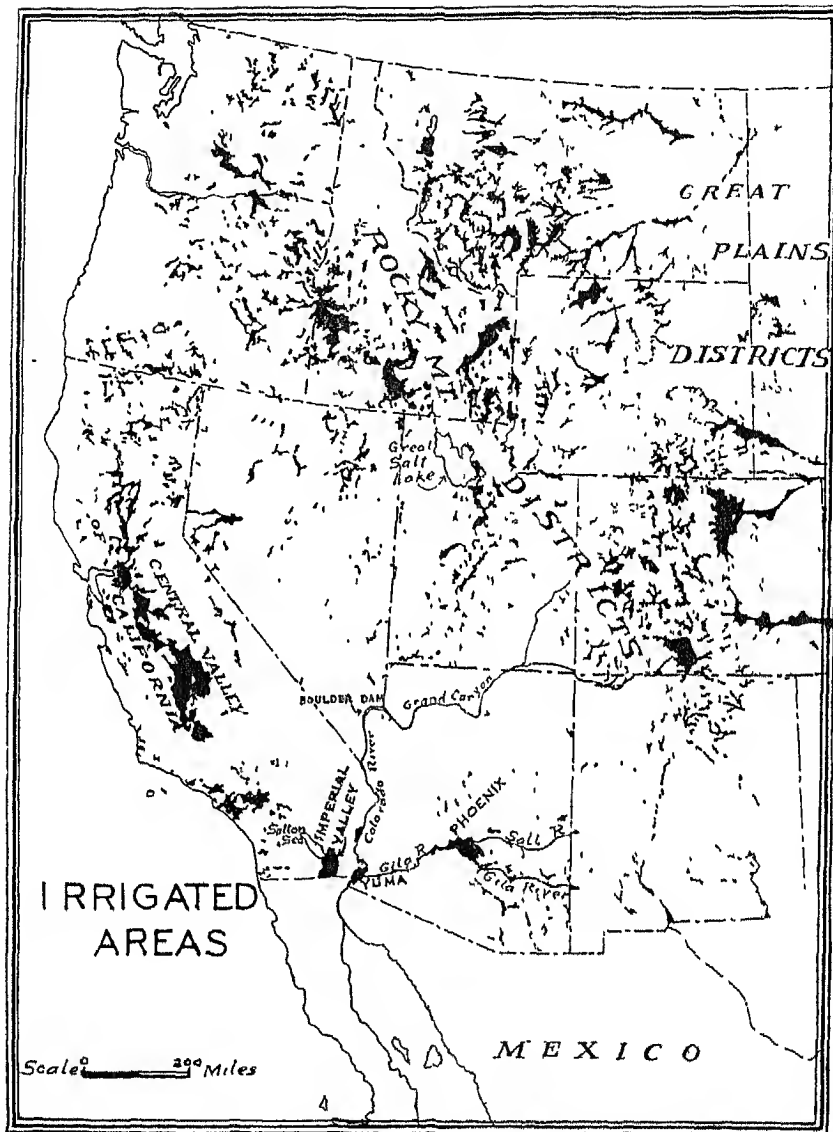
Irrigation in the Great Plains. Located to the east of the Rocky Mountains, the Great Plains comprise a large semiarid region. The rainfall is small in amount and irregular in distribution. Years of plenty are followed by periods of drought. Extremes of drought are sometimes experienced. During such periods the native vegetation dries up, crops fail, and the soil is exposed to the winds. In some districts strong winds carry the surface soil up into the atmosphere, sometimes to heights of 10,000 or 11,000 feet. Such atmospheric masses of dust, commonly called dust storms, then move eastward across our country, depositing large quantities of dust along their path. The largest of our dust storms originate in the Great Plains.

The Great Plains receive but little rainfall because they occupy an unfavorable location in regard to the rain-bearing winds. In the western part of our country the rain-bearing winds blow from the west. But the eastern and central parts of the United States get their moisture by means of winds that blow from the Atlantic and the Gulf of Mexico. The Great Plains are cut off by mountains from the western source of moisture, and they are located at a great distance from the eastern and southeastern sources of supply. Yet the eastern and southeastern sources are the most important, since the rainfall of the Great Plains decreases with progressive distance westward.

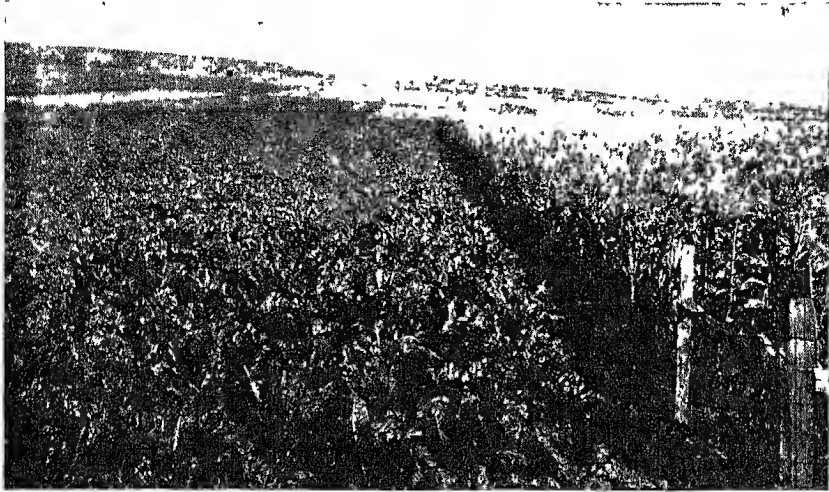
In the eastern part of the Great Plains a normal rainfall makes it possible to produce crops. But the western areas are given largely to grazing, except where irrigation is practiced. Since the western areas are located near the Rocky Mountains, it is possible to use the water of rivers and streams that rise in the mountains. The large rivers of the Great Plains have their upper tributaries beyond the crest of the highlands. Hence they are fed by more abundant rains and melting snows of the mountains.

Of rivers that flow across this region, the North Platte, the South Platte, the Arkansas, and the Yellowstone are noteworthy because of the great amount of land they irrigate. Look at the illustration on page 188 and notice the irrigated areas that have developed just east of the Rockies, where these rivers enter the Great Plains.

In some places huge dams have been constructed across the rivers. Thus the water of the river is held back behind the dam and there



Irrigated areas in western United States. Note especially the location of the Great Plains Districts, the Rocky Mountain Districts, the Central Valley of California. The district in lower Colorado is also an irrigated area.



An irrigated farm on the Belle Fourche Federal reclamation project in South Dakota, in the heart of the Great Plains area. At the left is a field of sugar beets, at the right is a field of corn. (Courtesy Bureau of Reclamation, U S Dept of Interior)

forms a reservoir or lake. From the reservoirs the water is led into large ditches. Each of these large ditches is tapped by smaller ones, which lead the water to the fields and orchards. In some of these areas the main irrigated crops are alfalfa, wheat, corn and sugar beets.

Great Basin irrigation. The Great Basin is located between the Sierra Nevada and Wasatch mountains. Most of it is a dry land, since the westerly winds have lost much of their moisture on the Sierras and coastal ranges farther to the west. Like the great arid Tarim Basin of Asia, its rivers do not reach the sea. Within the Great Basin are many smaller mountains that trend from north to south. Sediment has been washed from these mountains and deposited in the land below them. The western slopes of the mountains generally receive more rainfall than the eastern ones, and on some of these slopes wheat and other crops are grown by means of dry-land farming methods. But the lowlands of the basin are largely arid, being covered with sagebrush, cactus, and other desert plants.

The Great Basin has an interior drainage system, that is, the rivers and streams of the region do not reach the sea. The water of most of the rivers and streams evaporates under the influence of the desert sun. Some of the rivers and streams flow into lakes that also have no outlet to the sea. The most important of these is Great Salt Lake.

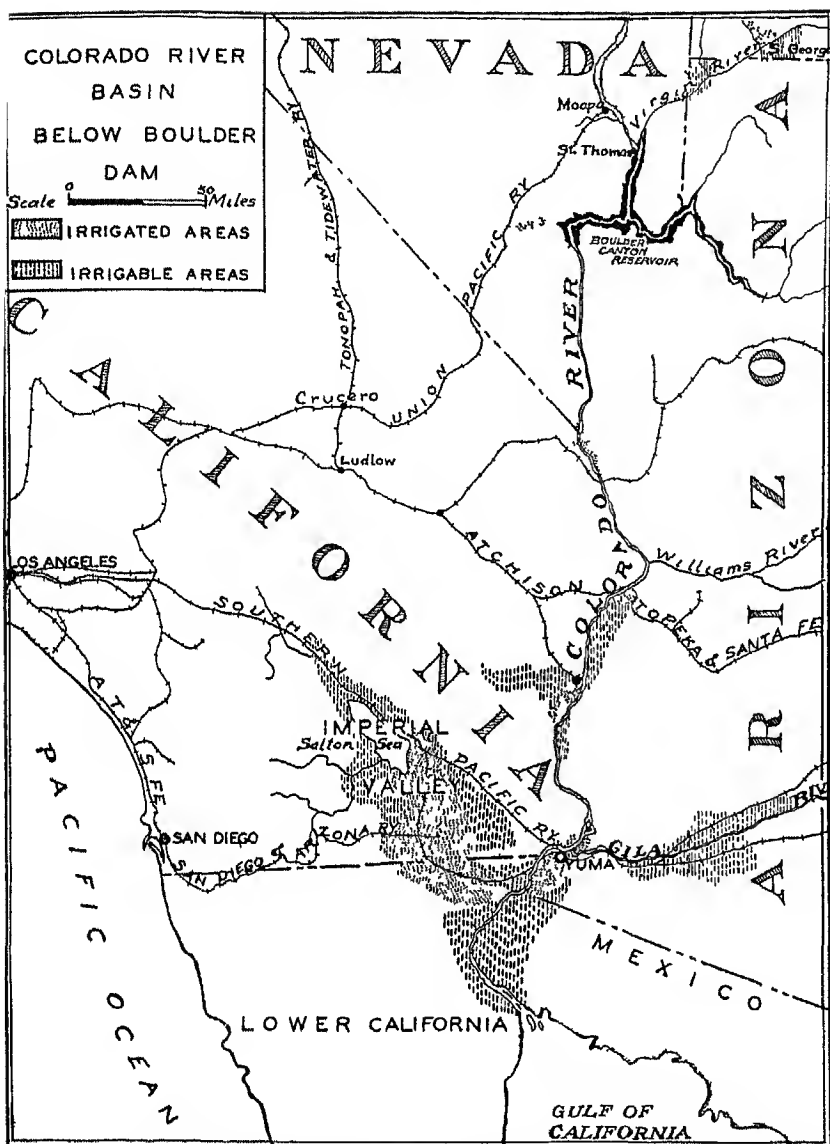
which is fed by streams that rise in the Wasatch Mountains. But evaporation from the surface of Great Salt Lake takes place about as fast as water flows into it. The salts and minerals washed from the highlands remain as the water evaporates, causing a high percentage of salt in the lake. This lake contains water that is so high in salt content that bathers float in it without any effort on their part. Such water cannot be used for irrigation, because salt is injurious to crops. But between Great Salt Lake and the Wasatch Mountains many important irrigation projects are found. They obtain their water from the streams that flow down the western slopes of Mount Wasatch.

Great Basin irrigation first developed by the Mormons. The first serious attempt at modern irrigation in our arid West was made by the Mormons. Under the leadership of Brigham Young a colony of Mormons settled in Utah on a flat area of land between the Wasatch Mountains and Great Salt Lake. They settled here as an agricultural community and began to reclaim the desert. Irrigation agriculture was employed at first largely in the production of alfalfa, which gave abundant yields, provided feed for livestock, and enriched the soil. They also planted fruit trees, sugar beets, and wheat. The agricultural development of the Mormon colony soon became known to many people in other parts of our country. After gold was discovered in California in 1848, many of the gold seekers followed a route which led by Great Salt Lake. When they returned home, gold miners spread the news of the success of the Mormons and their sure means of prosperity. Such information brought other people into the arid West.

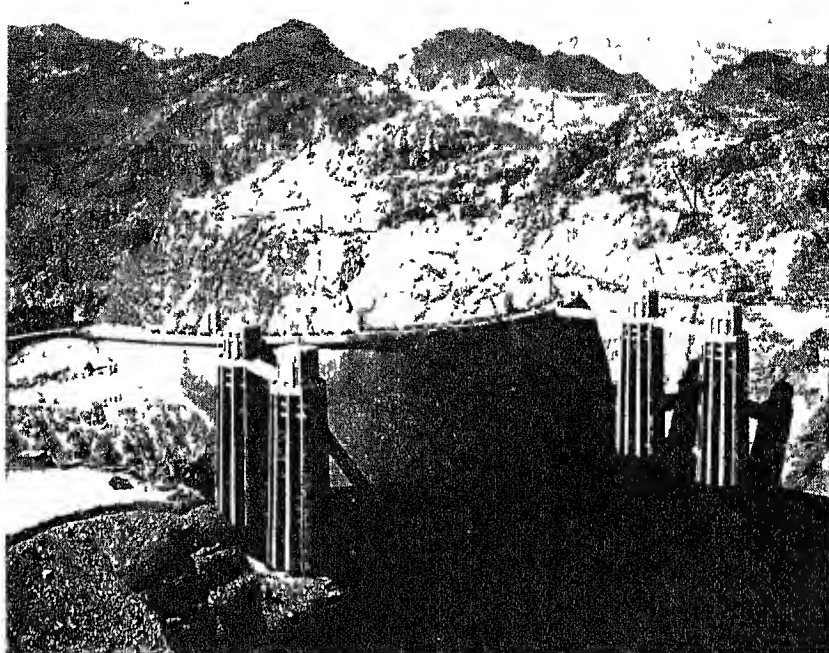
Other important irrigation units of the Great Basin are the Strawberry River Project located to the south of Great Salt Lake and the Truckee-Carson Project situated just to the east of the Sierra Nevada Mountains. In these irrigation systems great dams are constructed. These dams help to conserve the waters of the spring floods against the dry summer season, when they are released to supply water to hundreds of irrigation ditches below the dam.

Water that is released from the dam flows to lower levels and on its way is used to generate electricity. Thus hydroelectric power is commonly developed along with these large irrigation projects.

The crops of the irrigated areas consist largely of alfalfa, sugar beets, wheat, timothy, clover, and fruit. In these regions apples and peaches are important.



The major irrigated and irrigable areas in the Colorado Basin. Note especially the location of Boulder Canyon Reservoir, the Imperial Valley, and the Yuma Irrigation District.



Boulder Dam is the world's highest dam (727 feet). This view shows the upstream face of the gigantic structure just before the waters of the backed-up Colorado River had completely filled the reservoir shown in the foreground. Water passes through these four giant towers to generate electricity (Courtesy Bureau of Reclamation, U S Dept of Interior.)

Major irrigation projects in the Colorado Basin. The Colorado receives most of its water from the upper tributaries of its drainage basin. These tributaries are located on the humid slopes of the Rockies. But the lower part of the river flows through arid lands. Here also the Colorado Basin contains extensive areas of level land.

Boulder Dam One of the greatest irrigation projects of recent times has been completed at the great bend of the Colorado River, where Boulder Canyon is located. (Illus. above) Above this bend the river flows through a high plateau country, the Grand Canyon being located above Boulder Canyon. But below this bend the gradient or slope of the river is more gentle, since the Colorado River flows through a lowland region in its lower course. Thus Boulder Dam has been constructed at the bend of the Colorado River in order to prevent floods in this arid lowland region of the river valley. The dam has a height of 727 feet and holds back the waters

of the Colorado. It forms a vast reservoir with a storage capacity of 26,000,000 acre-feet of water. At the dam, water is led through giant intake towers to electric generators. Thus hydroelectric power development is associated with this project.

Irrigation to the east of the Lower Colorado Find the Gila River in the illustration on page 191. You will notice that the Gila flows into the lower part of the Colorado, and also that it has a tributary, the Salt River. The Salt River is located in the Arizona Highlands. In this highland region, Roosevelt Dam was constructed across a deep but relatively narrow gorge. By means of this dam the upper part of the Salt River has been converted into a lake that covers 18,100 acres and holds sufficient water to irrigate more than 200,000 acres of desert land. Although most of this irrigated land lies below Roosevelt Dam, there are about 50,000 acres above it. This higher land receives water by means of pumps that are operated by electricity. The electric power is developed at the dam. It is used to furnish light and power throughout this irrigated area.

At a distance of 75 miles below Roosevelt Dam one finds the city of Phoenix, the capital of Arizona. It is located in the midst of a rich agricultural area, but without irrigation this area would be a land of cactus and other types of vegetation. Here the climate is essentially tropical in character. It is often described as "eleven months summer and one month late spring." Crops grow the year round. The area produces long-staple cotton, alfalfa, dates, citrus fruits, vegetables, wheat, and barley. These give large returns per acre.

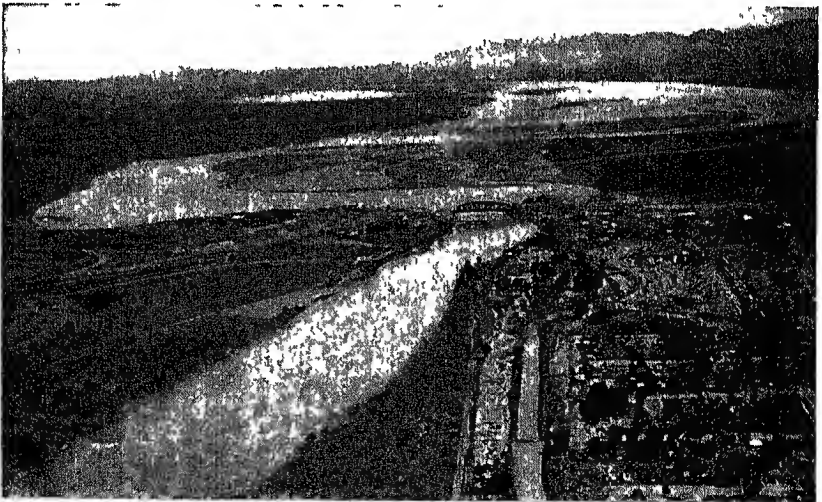
Below Phoenix, at the junction of the Gila and Colorado rivers, one finds



A date grove irrigated by a Federal project in the vicinity of Phoenix, Arizona. (Courtesy Bureau of Reclamation, U. S. Dept. of Interior.)



A grapefruit grove, the result of irrigation in the Gila Valley, not far from Phoenix, Arizona (Courtesy Bureau of Reclamation, U S. Dept of Interior)



Air view of Colorado River at Yuma-Colorado Bridge. This Federal Reclamation project irrigates 68,000 acres of crop land (Courtesy Yuma Chamber of Commerce.)



Typical desert country near Yuma, Arizona (Courtesy Yuma Chamber of Commerce)

the city of Yuma, Arizona. Near this city are vast stretches of irrigated land. Without irrigation this land produces nothing but desert grasses and shrubs. But with irrigation many valuable crops are produced. The crops of the Yuma area are similar to those grown near Phoenix. One of the most important crops is alfalfa, which yields many cuttings each year. The region also produces fruits, winter vegetables, and nut crops, such as the almond.

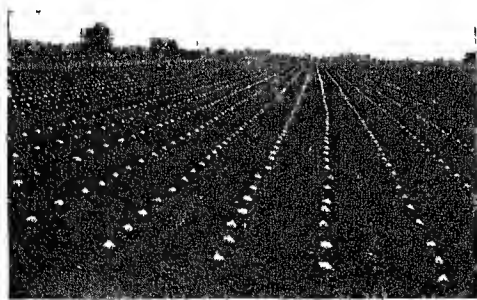
Land to the west of the Lower Colorado (Imperial Valley). Find the Imperial Valley in the illustration on page 191. A part of this valley is below sea level. Modern irrigation in the Imperial Valley did not take place until the beginning of the present century. A canal was completed in 1901 as a private enterprise rather than a Federal or Government project. It was dug from the Colorado River on the United States side, although part of the canal passed through Mexican territory. But in 1904 a canal was cut into the Colorado on the Mexican side. Thus more water was led into the Imperial Valley. The engineers in this area decided to close this cut before the spring floods of 1905, but the work was delayed, and a hastily constructed levee broke under the pressure of the swollen flood waters of the Colorado. The Colorado River therefore deepened one of its old channels which led to Salton Sea. After this flood of 1905 attempts were made to restore the river to its normal course, but the flood waters of the spring of 1906 broke through the levees once more. The waters swept into Salton Sea, which increased in



Six-year-old pecan trees and alfalfa, located in the lower part of the Gila Valley near Yuma, Arizona. Eight cuttings a year have been realized on this alfalfa field. (Courtesy Yuma Chamber of Commerce)

height so that the line of the Southern Pacific Railway was threatened. Then with Federal aid the engineers in this section succeeded in closing the break. Now levees are found at various weak points.

In spite of the difficulties encountered in establishing its system of irrigation, the Imperial Valley has become one of the distinctive producers of irrigated crops in our country. The high temperatures and the year-round period of growth favor the production of several crops a year. The fertility of the delta soils is another advantage. The region produces long-staple Egyptian cotton, melons, cantaloupes, lettuce, alfalfa, and citrus fruits. It is the leading region for the production of cantaloupes in the United States.



Young cantaloupe plants being protected from the hot desert sun by means of paper cap hoods. The Imperial Valley, California, leads in the production of cantaloupes in the United States. (Courtesy Southern Pacific Ry. Company)

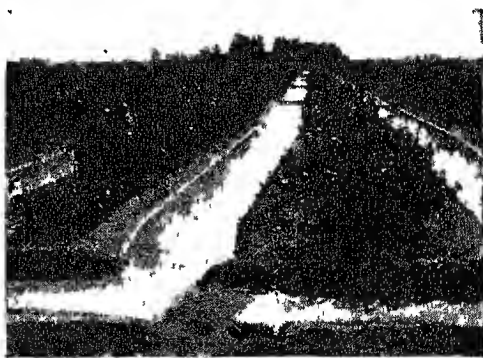
Irrigation in the Central Valley of California. Find the Central Valley of California in the illustration on page 188. You will see that it contains the valley of the Sacramento River in the north and the valley of the San Joaquin in the south. The rainfall decreases from about 25 inches a year in the northern part to about 5 inches in the south. Bakersfield,

located in the southern part of this area, has only 5.39 inches of rainfall a year. It should be remembered that an area with less than 10 inches of rainfall a year is considered a desert. Thus, much of the southern part of the Central Valley is a desert. Moreover, the valley as a whole receives but little rainfall during summer. Irrigation has therefore become an important activity throughout the valley.

With the aid of irrigation many crops may be grown. In the lower part of the Sacramento Valley rice is the special crop. This is one of the distinctive areas of rice culture in the United States. Melons, vegetables, fruits, corn, and many other crops are grown in this valley with the aid of irrigation. But the most noteworthy crop is the raisin grape.

The raisin culture of the Central Valley. The most highly concentrated area of raisin culture of the entire world is located in the Central Valley near Fresno, California (illus. below). Here most of the vineyards are located to the east of the San Joaquin, where they use the waters of the large tributaries of that river. These streams rise in the high Sierra Nevada Mountains which receive an abundance of moisture from the westerly winds. Moreover, this area is well adapted to the production of the best varieties of raisin grapes, such as the Thompson seedless and the Muscat varieties. These were introduced from the Mediterranean Region of the Old World, which, like this area, has desertlike summers. The abundance of sunshine favors the drying of the grapes.

The Northwestern irrigated districts. Irrigation has reached high points of development in many of the arid valleys of Washington, Oregon, and Idaho. Although there is a heavy and well distributed rainfall in the Pacific coastal areas of Washington and Oregon, the rainfall decreases with distance eastward. In the interior many of the valleys have a desert climate and contain sagebrush and other desert plants, with the aid of irrigation, however, many different kinds of



Raisin grapes grown with aid of irrigation near Fresno, California (Courtesy Sun Maid Raisin Growers Association)

crops are produced. The Yakima and Wenatchee valleys of Washington are noteworthy because of their apples. In Idaho, potatoes, alfalfa, and fruits are grown in many of the irrigated valleys.

MAJOR PROBLEMS

Problem of selecting suitable land. Among the more important facts to consider in selecting an area for irrigation are the character and depth of the soil, the slope and evenness of the land surface, and the facilities for drainage.

The native vegetation is one of the best indicators of the character of the soil in desert regions. Soil that supports sagebrush, buffalo grass, or cactus generally is fertile, easily tilled, and well drained. Yet additional drainage may become necessary when the land is irrigated. On the other hand, the native grasses, such as greasewood, creosote brush, and salt weeds generally grow on heavier and less easily cultivated soil. Such soils contain more or less of the injurious salts commonly known as alkali.

Irregular land surface. Land that has a broken or irregular topography is less favorable than nearly level or gently sloping areas. Considerable labor is required to reduce alternating heights and hollows to an even grade.

Land may also have too much or too little slope. The best conditions are found where land has a smooth surface with a slope of 10 to 20 feet to the mile. It costs comparatively little to put such land in shape for irrigation. Moreover, the gentle slope favors good drainage.

Drainage. Good drainage is essential. Many areas have been abandoned because of poor drainage. In all irrigated districts some water will seep into the subsoil when it is applied to crops. Unless this water can drain away naturally, it will raise the level of the ground water. When the ground water comes near the surface it may drown out crops and cause an accumulation of alkali at the surface. The water dissolves the alkali salts of the desert soil and subsoil. These salts remain on the surface when the water has evaporated.

Conservation of water. In many irrigated areas there is considerable waste of water. Some of the water is lost by absorption and seepage in the earthen channels of canals. Losses also occur in the ditches that supply farms. Ditches and canals should be made as

watertight as possible. This may be done by lining the channel with substances such as concrete, asphalt, or cement plaster. A large pipe may also be used as a substitute for an earthen ditch.

Losses of water also are caused because of faulty preparation of the land surface. An uneven surface causes needless waste of water. An uneven surface also makes it necessary to hire extra labor in spreading the water over the land. The water flows into the low places, which receive too much and therefore may become waterlogged, whereas the higher areas receive but little.

Water is also lost because of neglect and inefficient irrigation. When water is turned on a part of a field and permitted to run without attention, much of it may flow off the field and injure woods and adjoining farms. Wetting the surface and neglecting to cultivate it afterward may result in needless loss of water by evaporation. Too shallow and too frequent irrigation may cause losses. Generally the light, open soils retain but little moisture, and frequent irrigation becomes necessary, but heavy soils may become waterlogged. The proper amount and time of application of water needs further consideration.

How much water should be applied? The quantity of water to apply in one irrigation, and the length of time between each application will depend on a number of factors, such as the character of the soil, the climate, and the types of crops that are grown.

Since clay soils are much less porous than are the sands and loams, one of the problems is that of securing a deep penetration of moisture in the clay soil. When once watered, the clay soil holds the moisture much longer than the other types. Sandy soils retain but little water and need to be watered frequently, but with rather small quantities each time. Loam soils are intermediate between clays and sands in their moisture requirements.

The quantity of water to apply in one irrigation depends also on the kind of crop that is grown. In general, forage crops, such as alfalfa and clover, require the most, a medium amount is required for fruit trees, grain and potatoes; whereas corn and sorghum (cut for grain) and beans require the least.

Some climates have high temperatures throughout the year and therefore evaporation is continuous and rapid. In general the southern parts of our arid West experience a much more rapid evaporation than the northern areas. Moreover, in some parts of the West there is nearly enough rainfall to grow crops, and only a little additional

water is required, but in other parts there is so little rainfall that the water required by the crops must be furnished almost entirely by means of irrigation

QUESTIONS AND EXERCISES

1. How has irrigation aided the development of civilization? Name centers of early civilization which depended upon irrigation agriculture.
2. How did the Reclamation Act of 1902 aid irrigation in the United States?
3. Have irrigated districts any advantages over nonirrigated districts? If so, what are they?
4. What disadvantages are sometimes associated with irrigation agriculture?
5. Have irrigated districts any advantages over adjacent desert and semi-arid regions in regard to social and community life?
6. What are the major types of irrigation?
7. What are the chief sources of irrigation water in the Great Plains? Why is irrigation more widely practiced in the western part of the Great Plains than in the eastern part?
8. What are the advantages of Boulder Dam?
9. Name typical crops that are grown by means of irrigation near Phoenix and Yuma, Arizona, and in the Imperial Valley.
10. Why are most of the raisin-grape vineyards of California located in the eastern rather than western part of the San Joaquin Valley? What are the advantages for the production of raisins in this area?
11. List the major problems associated with the selection of suitable land for irrigation

FURTHER READINGS

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- Compton's Pictured Encyclopedia, F. E. Compton and Company, Volume 7. Pp. 147-150 (Fifteen volume edition)
- Fortier, S., "With the Irrigation Farmer" *Yearbook of Agriculture*, Washington, D. C., 1920 Pp. 203-216.
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IMPORTANCE

Important role played by our forests. Forests are not only a primary source of timber and timber products, but they also serve many other important purposes. For example, on many steep slopes erosion would ruin the land if it were not for the forests. Soil moisture is retained in regions of forests, whereas open or cleared areas are exposed to rapid evaporation. Since the streams of forested highlands fluctuate less than those of unforested areas with similar climate and slope, they are better suited to waterpower development. Forests also provide refuge for wild animal life, and in many areas they are used as pastures for livestock. In some places forests act as an important windbreak. In addition, millions of people use the forests each year as recreation grounds.

Consumption of wood products. Although many of us do not purchase basic forest products, such as lumber and wood pulp, practically every man, woman, and child in the United States uses wood in one or another form. Forest products are used in obtaining other natural resources. For example, in the mines wood is commonly used in the form of mine prop timbers. During normal times the coal mines of the United States consume from 200,000,000 to 300,000,000 cubic feet of wood. Food is produced with the aid of wood in some form, and much of it is shipped in containers made from wood. Even cellophane is made from chemically treated cellulose, which in turn comes from pulpwood. About nine-tenths of the paper used in printing is made of wood. More than nine-tenths of the farm dwellings of America are made of wood. Thus timber products play a very important part in our daily lives in spite of the ever increasing number of substitutes for wood.

The United States is the leading nation of the world in the use of wood. We consume nearly as much lumber as is consumed by the rest of the world, more than half of the paper, and nearly two-fifths of the wood in all forms. Such heavy consumption of timber at the present time makes it necessary to import timber products. Of such

imports, pulpwood and paper from Canada and northern Europe are most important

Unfortunately, many of our forested areas have been ruined and much timber wasted. Some of this waste was brought about by the exceedingly rapid clearing of land for agriculture, and especially when there was no good market for the timber. Still more waste was brought about by forest fires. Thus our timber reserves have been greatly reduced. Because of the reduction of reserves, the yearly growth of new timber is much less now than it was when our country was first settled. At the present time the amount of timber cut yearly for lumber, plus destruction by fire and other means, is more than four times as great as the amount of new timber that is added each year through forest growth. This fact suggests the great need to conserve the remaining stands of our forests. In the past, timber has been cut from our forests much as minerals are mined from the earth. In other words, the timber has been handled like a *mineral* rather than a *crop*.

MAJOR TIMBER-PRODUCING REGIONS

The eastern and western divisions. The forests of the United States cover nearly one-fourth the total area of our country. They are made up of two great divisions, which may be called the eastern and the western forests. Between these divisions lie the vast treeless plains and prairies.

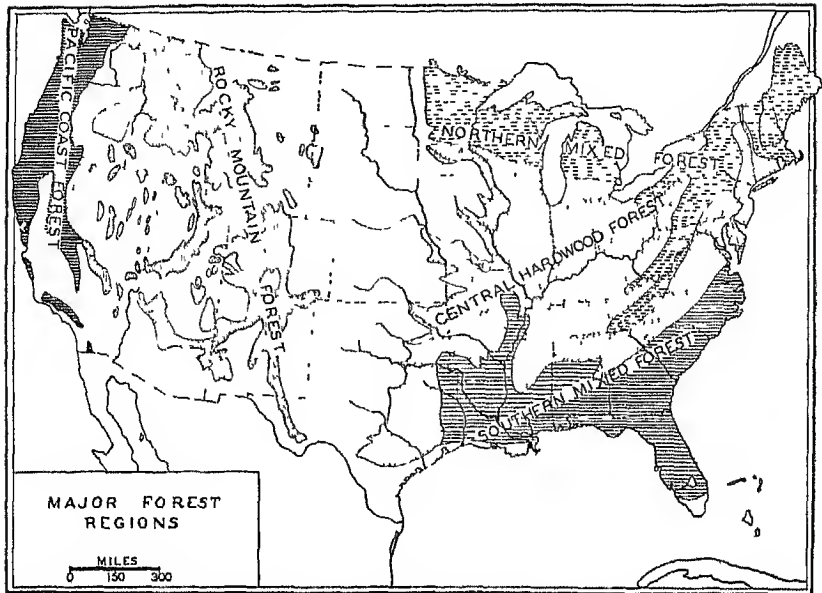
The eastern and western divisions may be further subdivided. The eastern division contains the Northern Mixed Forest, the Central Hardwood Forest, and the Southern Mixed Forest, as shown in the map on page 204. The western division contains two major forested regions—the Rocky Mountain Forest and the Pacific Coast Forest.

The Northern Mixed Forest. This forested belt stretches from the treeless plains on the west to the Atlantic on the east and northward to Canada. It therefore reaches its greatest extent in the areas of the Great Lakes and New England. These are mixed forested areas because they contain conifers (evergreen) as well as hardwood (broadleaf) trees. Pine, spruce, and hemlock predominate, although a number of places also contain important stands of maple, birch, and beech. The pine, when sufficiently large, is generally used for lumber and other building material, but only a small part of the

original pine reserve remains. The spruce, because of its structure and lightness, makes excellent paper. Some spruce has also been used in the making of airplane wings, but light metal alloys are displacing wood for this purpose. Hemlock is used largely for pulpwood and paper, although the larger trees are also employed for building material. The hardwoods of the region are used chiefly for furniture and building material. Many of the maple trees are tapped each year for their sap, which is used in the making of maple syrup and maple sugar.

The manufacture of pulpwood and paper is the leading forest-product industry of the Northern Mixed Forest. Many of the small and crooked trees—in fact, even large branches—may be used for the manufacture of pulpwood and paper, whereas trees with large straight trunks are used for lumber. Most of the large trees have already been removed, mainly in clearing land for agriculture. In the Lake States, Michigan, Wisconsin, and Minnesota, the present pine forests are less than one-fiftieth of their original size. These forests were used largely for lumber, and the remaining smaller trees are better suited to paper manufacture. Conifers rather than hardwoods are generally used in the manufacture of paper, and they predominate in this region. In addition, northeastern United States is the leading region of our country in the consumption of paper.

The Central Hardwood Forest. As shown in the illustration on page 204, the central hardwoods extend from the Northern Mixed Forest to the southern forests of our country. Originally the Central Hardwood Forest covered more land than any other of our major forest regions; but its trees have also been removed to the greatest extent, largely to make room for agriculture. The region contains some of the best agricultural land of America, including the forested river valleys of the prairie states and the eastern half of the Corn Belt. The drier western part of the Corn Belt was almost entirely grass-covered. The great Ohio River Basin also lies within this forested belt. When it was first settled, the Central Hardwood Forest covered 34 per cent of the total forested area of our country. But clearing of land for crops, forest fires, and other causes have reduced the forests greatly. The region now contains only 13 per cent of our total forested land, and most of it is cut-over woodland located on farms. Very little virgin timber remains in this region, and the total stands of timber suitable for lumber are only 2 per cent of our country's total stands of saw timber.

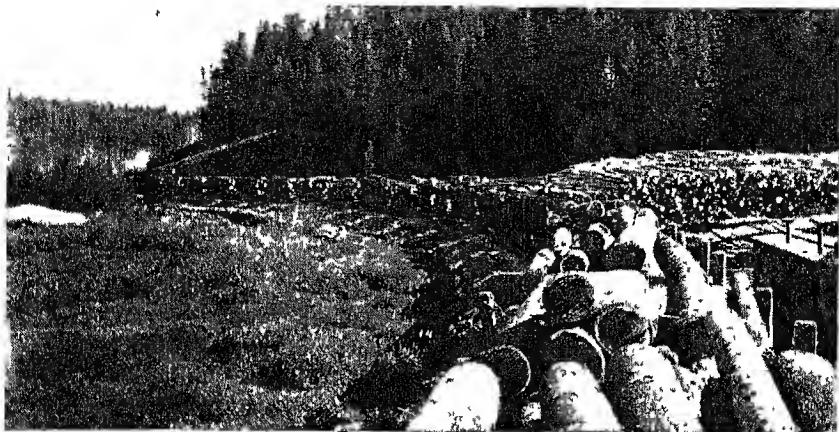


The main forest regions of the United States. Note the three regions in the East and two in the West.

In the Central Hardwood Forest there is a marked absence of needle-leaf trees. Although many of the hardwood trees found here are the same as those of the Northern Mixed Forest, other trees are either lacking or found only in a few places in the northern region. For example, the chestnut, the hickory, and the sycamore are widely distributed in the central woodlands.

The Southern Mixed Forest. Like the Northern Mixed Forest, the southern region of our country contains mixed stands of conifers and hardwoods. But the species in both of these groups of trees differ from the northern ones. Here southern yellow pine makes its appearance. The South also contains the bald cypress and the white cedar. Oaks and gums are the prevalent hardwoods.

As in the forest regions farther north, the stands of southern timber have diminished rapidly. Only a small part of the original supply of southern pine remains, since this type of tree has long been cut for lumber and other building material. Even at the present time southern pine is one of the leading saw timbers of America. Moreover, the South is one of the two chief regions of lumber production in the United States, the other being the Pacific Coast



Logging in the Rockies of Idaho Timber is one of Idaho's major resources Logging in the Rockies takes place in the more accessible areas (Photo by J. F. Anderson, courtesy Idaho State Chamber of Commerce)

Forest. But the South contains only 12 per cent of the remaining saw timber of the United States, whereas the Pacific Coast Region possesses about 63 per cent of our total stand. Thus the Pacific Coast Region has much larger reserves for the future.

Forest industries will long remain in the Southern Mixed Forest, because of advantages in the South for the production of timber. For example, the long growing season and the abundant rainfall favor the tree growth. It is noteworthy also that the southern pines as a group rank among the most rapidly growing trees of our country. The control of forest fires is much less of a problem in humid, moist lands than in dry ones. The South is one of the humid regions of our country. The South has much cheap land that is better suited to forests than to crops. The levelness of much of the South, especially the Atlantic and Gulf coastal plains, makes the region one of the cheapest in the United States for logging operations. In addition, the South is favorably located with respect to our largest markets for timber products.

The Rocky Mountain Forest. The forests of the Rockies are distributed in irregular patches. They also vary greatly in size from place to place, because of differences in elevation within this mountainous region. For example, the trees found near the upper timber line are small and stunted in growth, whereas the moist lower slopes contain larger and more valuable stands of timber.



Four giant timber species in Olympic Peninsula, Washington: Douglas fir, Sitka spruce, hemlock, and western red cedar. (Photo by Jones Photo Co; courtesy Aberdeen Chamber of Commerce)

Unlike the three eastern forest belts, the Rockies have been but little exploited. They still contain the greater share of their original stands of timber. Logging takes place in some of the more accessible areas. (Notice the picture on the preceding page.) But most of the forested districts of the region are inaccessible, suffer from high cost of transportation, and are located at a distance from the large consuming markets of the United States.

The chief trees of the Rocky Mountain Forest are the western yellow pine, the lodgepole pine, the spruce, and the fir. In some districts these have

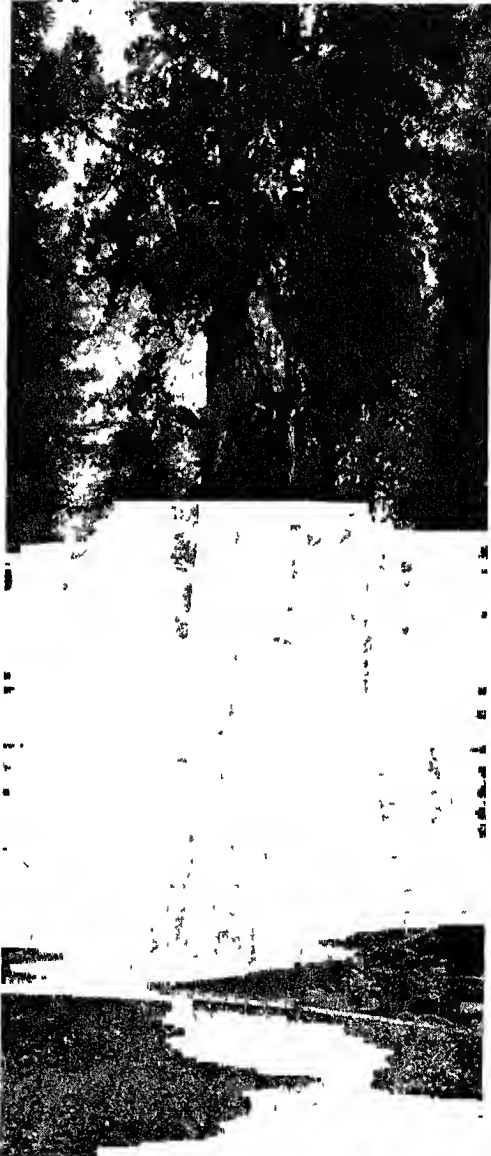
been injured by forest fires, but these are held in check through the work of our forest rangers. Much of this region has been taken over by the United States Government as timber reserves, now called national forests.

The Pacific Coast Forest. The Pacific Coast Forest is noteworthy because of the gigantic proportions of much of the timber. This is the home of the sequoias. Here also are large stands of Douglas fir, pine, hemlock, cedar, and spruce. The giant sequoias or "big trees" and the redwoods are found in California. The Douglas fir is the chief type of tree in western Oregon and Washington. Pine predominates in the interior highlands of California and to the east of the Douglas fir areas in Oregon and Washington. Spruce is found in small scattered patches throughout the high mountainous parts of the region.

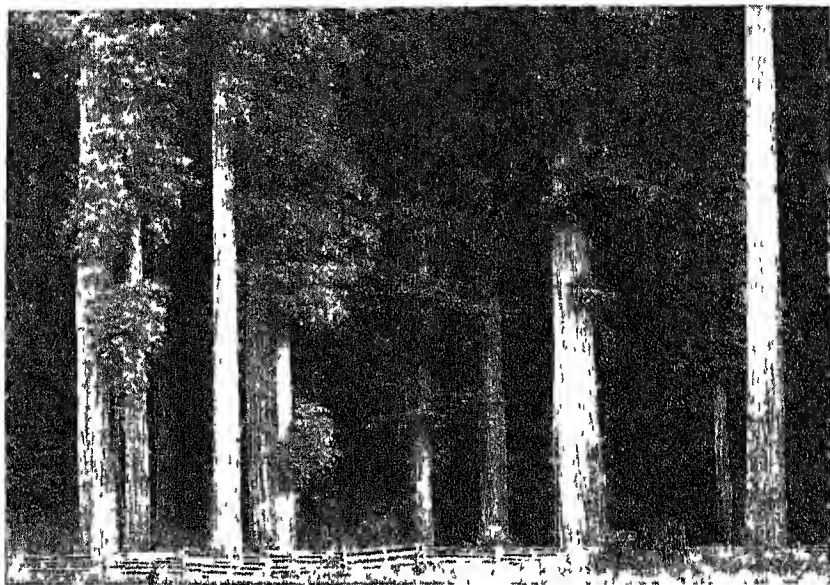
The sequoias are among the most majestic and awe-inspiring things of nature. They are of two species, the "big trees" and the redwoods.

The "big trees" are found along the western flanks of the Sierra Nevada Mountains, where they are able neither to advance nor retreat. Their age is measured by the centuries. The largest trees that have been felled show annual rings in the wood indicating an age of more than 3,000 years. Some of the remaining giants are probably more than 5,000 years old. In size they are imposing as is no other living thing. They average 275 feet in height and 20 feet in diameter, and some even exceed a height of 340 feet, with a diameter of from 25 to 30 feet. In the past many of these giants have been cut for their lumber; but the remaining trees have come under state and Federal protection.

On the other hand, the redwoods are much more plentiful, and they are being cut largely for lumber. Although smaller than the "big trees," the redwoods closely resemble them, since both are sequoias. In fact, the redwoods are considered a younger growth of "big trees." They are located in the fog- and



The "General Sherman," one of the giant sequoias which is now being preserved. Some idea of its enormous size may be gauged by comparing it with the men standing on the base. (Courtesy H. C. Tibbitts, San Francisco)



Redwood trees along the Redwood Highway in California (Courtesy H. C. Tibbitts, San Francisco.)

rain-drenched parts of California's coast ranges. (Illus above.) The wood of these trees is light in weight, straight-grained, and easily worked. The lumber is remarkably free from knots, since the branches start far up on the trunks. When properly dried, the wood neither warps nor shrinks, and it lasts for centuries without rotting. It is not easily destroyed by fire, since it contains no resin.

Various of the other trees, such as the Douglas fir and cedars also attain great heights, as shown in the illustration on page 206. It is therefore not surprising that the Pacific Coast Forest contains the greatest number of board feet per acre of any major forest region in the world. Although much timber has been removed from this region, it still contains 63 per cent of all the saw timber of the United States. At the same time, it covers only 14 per cent of the total timber acreage of our country, which means that its stands of timber are four and one-half times as large as the average stands of the United States.

| The forest industries of this region differ strikingly from those of other parts of our country. Let us, therefore, turn our attention from the discussion of stands and reserves of timber to the production of forest products in the various major regions.



Three sledloads of red pine and white pine in Minnesota (Photo by U. S Forest Service.)

THE UNITED STATES AS A PRODUCER OF LUMBER

The migration of our lumber industry. The first important lumbering industry of our country was centered in New England. Here it was closely associated with the building of sailing vessels. It also satisfied the requirements for building material in that region. In addition, some of the lumber was exported to Europe. But the rapid development of the industry was soon followed by depletion of the better timber reserves, especially the stands of white pine. Since large stands of white pine were also located in states farther to the west, the industry shifted into the region of the Great Lakes, through Michigan, Wisconsin, and Minnesota. (Illus. above.) These states were the chief source of our lumber in the eighties and nineties of the last century. The white pine was recklessly hewn from the forests, in part to satisfy our lumber requirements, but also because

of the rapid expansion of agriculture in that region. Forests were cleared in order to make room for crops, until now only 2 per cent of the original white pine trees of these northern states remain. Consequently, the center of the lumbering industry shifted to the South, where the southern yellow pine furnished the bulk of our lumber. Large-scale lumbering operations in the South greatly reduced the timber stands of that region, and the center of the industry shifted to our Pacific Coast Forest. The South is still an important source of lumber, contributing nearly one-third of the nation's supply, but the Pacific Coast Region furnishes about two-fifths of the lumber consumed in the United States.

Distinctive logging methods. In the Northern Mixed Forest of the Lakes States and New England logging operations generally take place during the winter season. This region has low winter temperatures, which cause heavy freezing of swamps and marshes, and a blanket of snow covers the forested areas for a considerable period of time. These conditions favor logging operations, since many forested swamps and marshes are inaccessible except when frozen over. The blanket of snow makes it easy to transport the logs through the forest. (Illus. below.) With the aid of low logging sleds, a good team of horses can pull a load of logs weighing several tons. In some districts the logs are transported to rivers and streams, on which they are floated to the sawmill centers during the spring



A winter logging scene in New Hampshire.
(Photo by U S Forest Service.)

of the year. In most districts the sawmills were not permanent, but were moved from place to place as the timber was cut. Many of the sawmill towns that had developed along with the lumbering industry dwindled away after the logging operations ceased in the neighboring forests; but in some districts the forests, when cleared of trees and stumps, were converted into croplands, and the former sawmill towns be-



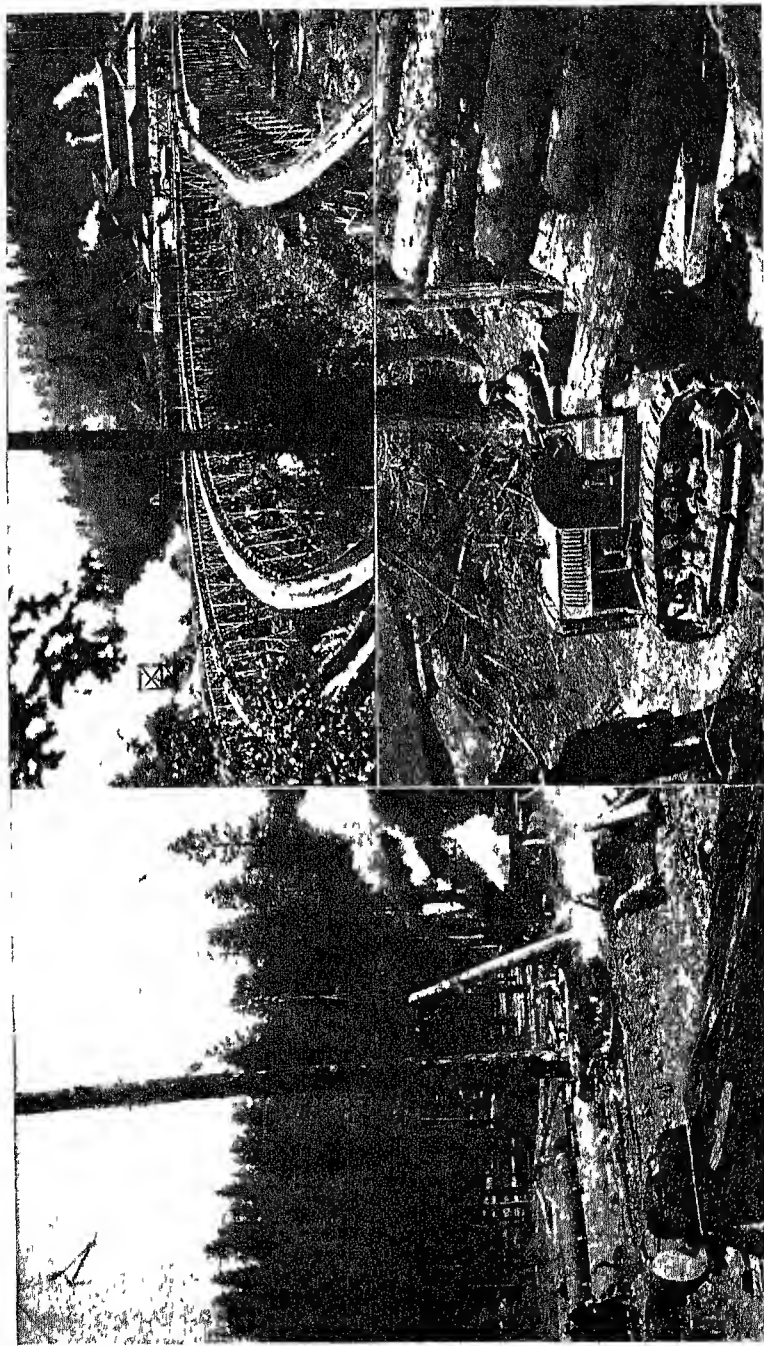
Longleaf pine ties about to be floated down stream in Ocala National Forest, Florida (Photo by W F Hill, courtesy U S Forest Service)

came trading centers for the agricultural population. Some of these centers now have wood-working industries.

In the Southern Mixed Forest the logging operations differ strikingly from those of the Lakes States and New England. Although some snow falls in the South, it disappears in a short period of time. Logs are often taken out of the forests with the aid of a tractor and two large wheels. One end of the log is supported on a heavy bar between the wheels, whereas the other end drags on the ground. In districts of large-scale lumbering operations, fixed engines are used to pull the timber to logging railways. Logs are also floated out of the forests on streams and rivers, as well as on canals that are dug for that purpose.

In the Rocky Mountain Forest the chief areas of commercial timber are located on the highland slopes. The logging railways are situated in the valleys, and logs are dragged down the slopes to the railway lines. Tractors are able to drag large loads of logs weighing several tons, because the timber is pulled down grade, as shown in the illustration on page 212.

In the Pacific Coast Region the logging practices have been affected largely by climate, topography, and tremendously large trees. Under the influence of the westerly winds which blow from



The transportation of timber left, with the aid of a cable and a donkey engine, near Westwood, California; top right, by flumes in the Sierra National Forest, California; bottom right, by caterpillar tractor to the railroad in the northern Rocky Mountains (Photos by K. D. Swan and W. I. Hutchinson, courtesy U. S. Forest Service)

the Pacific Ocean, this region lacks the extremely cold winter weather which is so characteristic of the Lakes States and New England. In relief, much of the region is extremely rugged, and waterfalls are formed as streams plunge over steep rock ledges. Under such conditions timber cannot be floated down the mountain side. In size of timber, the region is distinctive. The great number of board feet per acre make it possible to use large expensive machines in cutting trees and transporting logs. By means of cables and flumes timber is transported in this region of rugged relief, as shown in the pictures on the opposite page. Where the slopes are gentler and the timber smaller in size, the logging practices are quite similar to those of the Rocky Mountain Forest.

THE UNITED STATES AS A CONSUMER OF LUMBER

The world's leading consumer of lumber. The United States consumes about 35,000,000,000 board feet of lumber each year. This timber comes almost entirely from our own forests. Although we import some lumber from foreign countries, our lumber exports are normally much larger than the imports. The exports, however, are less than one-tenth of our total consumption. Thus the United States consumes nearly all the lumber that it produces.

Is our consumption of lumber going up or down? Under normal conditions our lumber consumption has not varied greatly from year to year. But the nation's population has increased steadily. Consequently, the per capita consumption of lumber is gradually declining in this country. To an ever increasing extent we are using substitutes for lumber. Can you name some of these substitutes?

The major consuming area in the United States. The northeastern part of the United States is our leading consumer of lumber. In population it is an area of many large cities and densely peopled areas; in manufacturing it shows veritable beehives of industries, in transportation it contains a web of roads and railroads; and in trade it is one of the hubs of the commercial world. What combination of conditions could be more favorable for a large consumption of lumber! Accordingly, northeastern United States uses yearly from two-fifths to one-half of all the lumber that is produced in our country.

In 1920 the South was still the major lumber-producing region,

but at present the leadership has passed to the Pacific Coast Forest, which now accounts for two-fifths of our total supply. As the western region is gaining at the expense of the South, ever-increasing amounts of lumber are being hauled a great distance. The distance from the central area of southern-pine production at Hattiesburg, Mississippi, to the central area of our major consuming region (about at Erie, Pennsylvania) is 1,200 miles. But the distance from our Pacific Coast Forest to this central area of consumption is 2,750 miles. Greater distances mean higher transportation costs.

The Pacific Coast Region has many advantages in spite of its distance from the chief consuming region. For example, its great stands of giant timber are converted into lumber at relatively low costs because of the tremendous use of modern labor-saving machines. Because of the large stands of timber, machines can remain in one place for some period of time. From large trees may be obtained large-dimension stock of lumber, such as very long and wide boards. Some of the forest types, such as the redwood trees, resist decay and will survive for many years even in contact with soil. Such lumber has special uses. Great quantities of lath are obtained from the slab or outer part of the log which is cut away in the process of obtaining the lumber. Moreover, this region is America's leading source of cedar shingles.

THE UNITED STATES AS A PRODUCER AND CONSUMER OF PULPWOOD

Producing regions. Pulpwood is used largely in the manufacture of paper. The most suitable types of timber for that purpose are the conifers, especially hemlock, pine, fir, and tamarack. Some broadleaf trees, such as the poplar, are also used. Since pulpwood can be made from small and even crooked timber as well as large branches, the cutting of pulpwood timber takes place largely in New England and the Lakes States. Another important area of production is located in the Douglas fir region of Washington and Oregon. In the West the pulpwood is obtained not only from the smaller trees but also from the tops and large branches. Their trunks are commonly used for lumber.

Methods used in manufacturing wood pulp. Before it can be used in the manufacture of paper, pulpwood is converted into wood pulp. Four methods are generally employed—the mechanical, the sulphite process, the sulphate process, and the soda process.

By means of the mechanical process the wood pulp is prepared from logs of wood by physical means. This pulp is generally inferior in quality to that produced by the other three methods, since it contains all the resinous and gummy matters of the original wood. The pulp is prepared from logs of wood cut up into two-foot lengths. After the bark has been removed, the logs are split up into pieces of a convenient size for grinding. The grinding is accomplished by means of a stone which tears away the fiber by friction under water. The water carries the fiber away into a pit. After removal of excess water, coarse knots, and chips, the pulp is ready to be used for making paper.

§ In the sulphite, sulphate, and soda processes the wood chips are converted into pulp with the aid of chemicals.

All four methods of pulp manufacture require large amounts of water and power. The pulp mills have therefore been located in regions that have the proper kinds of timber for pulp manufacture, cheap water power, and an abundance of pure water. These conditions are found in the northeastern as well as northwestern regions, and here most of the pulp and paper mills are located. The northeastern region has the additional advantage of being the largest consumer of paper in America. But the western market is growing steadily and the number of pulp and paper mills in that region is increasing.

The United States is still self-sufficient in lumber, since it normally produces more than it consumes. But that is not the condition of our wood-pulp industry. The ever increasing use of all kinds of paper has called for more wood pulp than can be produced cheaply within our own country. Thus we obtain more than half of this material from the Canadian forests.

THE TANNING AND NAVAL STORES INDUSTRIES

The tanning industry and our forests. Most of the material used for tanning leather is obtained from trees. In the United States the bark of trees is the chief source of tannin. Trees best suited for this purpose are the hemlock, oak, and chestnut. These trees are widely distributed in the southern Appalachian forests, where their bark is removed for tannin. In the Northern Mixed Forest, much hemlock bark is available at the pulp mills. In the South, the bark of the chestnut tree is an important source of tannin. Some bark is also

used for that purpose in the West, but the region suffers because of distance from the chief centers of the tanning industry

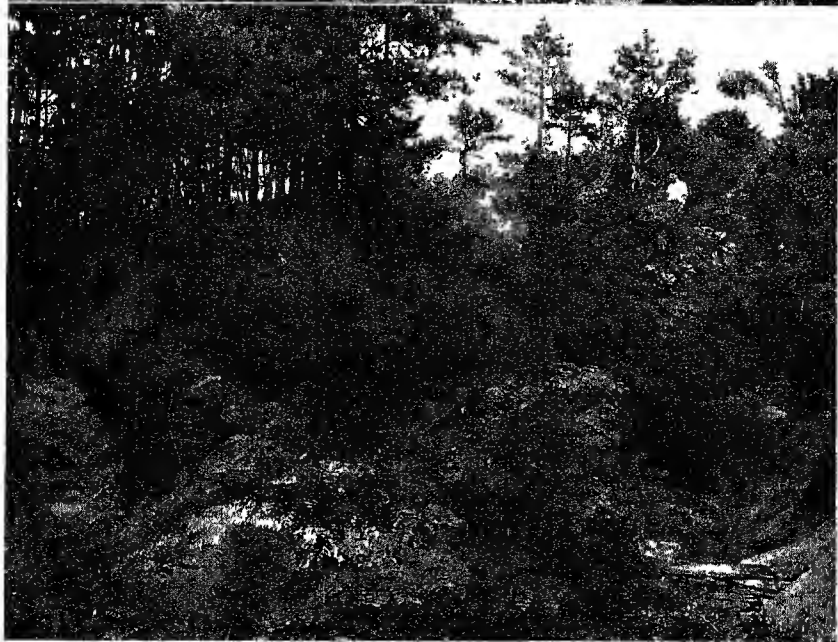
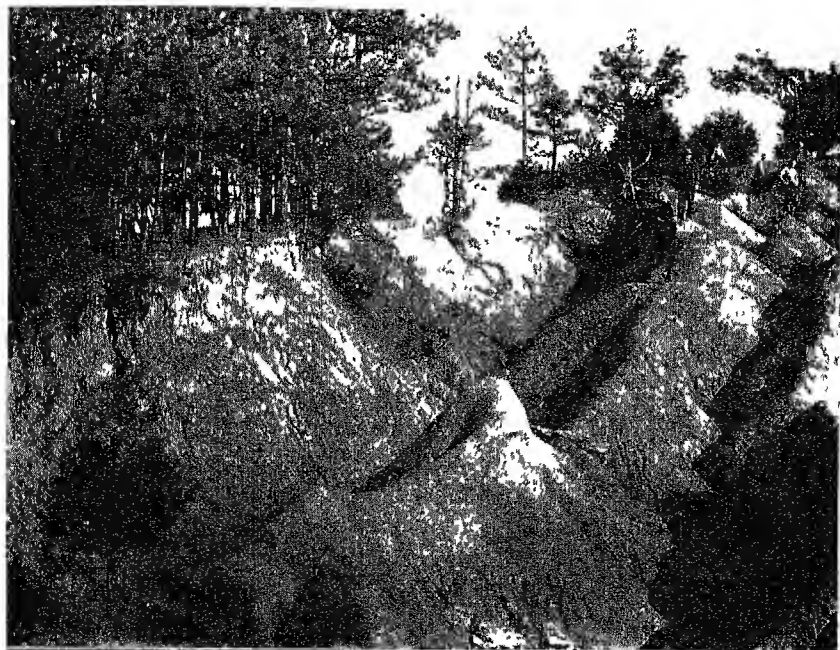
Materials for tanning are also obtained from foreign countries, one of the chief sources being Argentina. In northern Argentina tannin is obtained from the quebracho tree. Our trees such as the hemlock, chestnut, and oak contain tannin largely in their bark. On the other hand, the heartwood or inner part of the quebracho is the chief source of tannin. This product is of very high grade and is exported to all leading leather manufacturing countries

Naval stores industries.

Among the forest industries of the South, the making of naval stores is important. The naval stores include turpentine, resin, tar, and pitch. These products are called naval stores because they were essential during the wooden-ship period of the shipbuilding industry, especially in New England. The center of the industry was first in New England, but gradually it has shifted southward. At the present time the South is our main source of supply. Here the finest turpentine is made by distilling the resin or sap of the southern longleaf yellow pine (Picture at left.) Unfortunately, there has been much waste in this industry, chiefly because of the manner in which the resin has been obtained. But these methods have largely been abandoned.



Clipping a longleaf pine, Ocala National Forest, Florida. The cups placed along the side of the tree catch the resin as it flows down the cut. From resin, turpentine and rosin are obtained. (Photo by U. S. Forest Service)



Above, uncontrolled running water slashed this hillside on a farm in the Norris Dam reservoir until it was useless for cultivation or grazing Below, the same hill 18 months later, after treatment by TVA foresters (Courtesy TVA)

CONSERVATION OF OUR FORESTS

Evils of reckless exploitation. The United States was endowed with seemingly boundless forest resources. Many of the pioneers took what they wanted and destroyed what stood in their way. In many districts there was hardly anything else to do, especially where forests had to be cleared to make room for agriculture, and markets for the timber were lacking. But there has also been considerable loss of timber because of fire and destructive methods of logging.

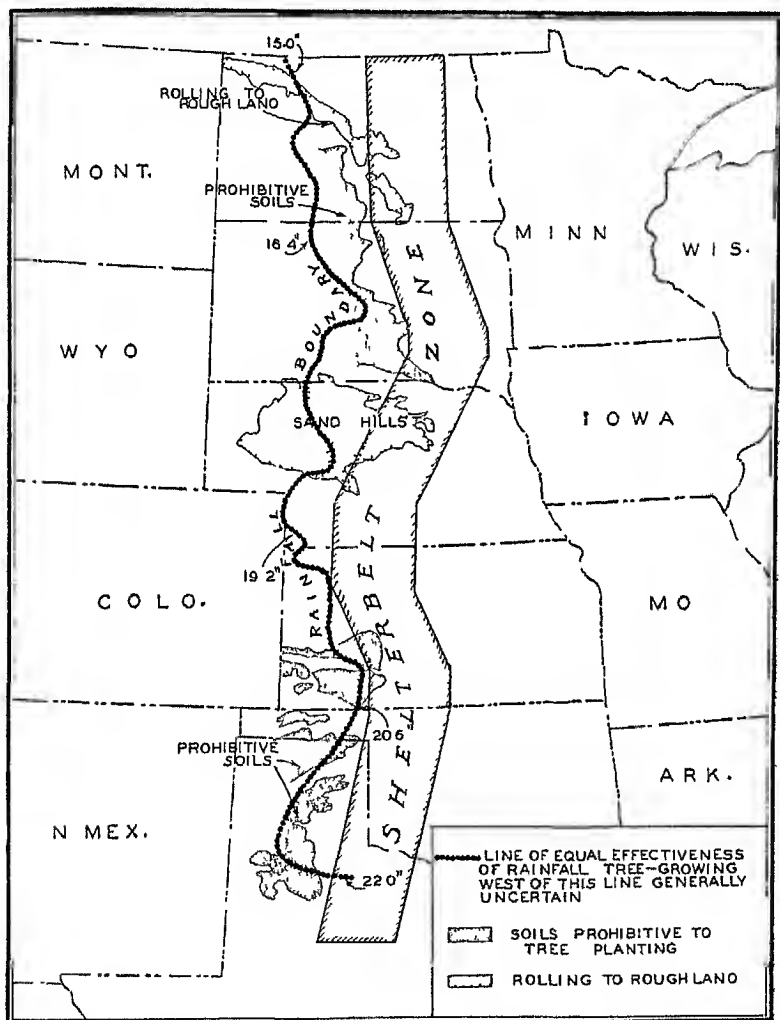
Forest fires have swept over many areas, completely destroying valuable stands of timber. Such fires have often been caused by carelessness on the part of farmers, lumbermen, and campers. Some have also been started by sparks from locomotives. Branches and tops of trees that remain after logging operations constitute fuel in which some of our largest forest fires have had their origin. Other fires have swept through windblown materials. Most of our large forest fires have occurred when the air has contained but little moisture—that is, during periods of low relative humidity. Care should therefore be taken not to burn brush or set fires in forested areas during such periods. The tourist, neglecting to put out his campfire, may cause considerable loss of valuable timber.

The area of virgin timber in the United States has therefore been greatly reduced. The eastern forest belts have witnessed the most rapid depletion of timber, and the greater part of our virgin timber is now located in the Pacific Coast and Rocky Mountain forests. But the destruction of forests means more than loss of timber. It means increased erosion and floods as well as the depletion of soil and water resources.

Our national forests. Almost nothing was done to prevent the reckless cutting of timber until 1891, when Congress granted the President the right to create timber preserves. These are now called national forests, and their total area is about 160,000,000 acres. In these national forests great care is taken in handling the timber. Trees to be cut for sale are marked in advance by forest rangers. A sufficient number of the younger and seed-bearing trees will be left to insure later crops of timber. Lookout stations have been established from which trained foresters may view the surrounding country for many miles with the aid of telescopes in order to plot the location of forest fires. Forest rangers are sent into such areas to

prevent the spread of the fires. Burned-over areas are restocked with trees

Shelterbelt of the Great Plains. One of the most interesting and valuable of the tree-planting projects of our country is that of the



The great Shelterbelt Zone which extends through North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and into Texas. In this zone, shelterbelt strips have already been planted. Note the factors that have been considered in determining the western boundary of the zone. (After U. S. Forest Service.)

Shelterbelt Zone In 1934 Congress appropriated a huge sum of money for the relief of the people of the drought-stricken Great Plains. As part of the program, shelterbelts were to be planted on about 1,000,000 acres of farm land within a 100-mile-wide zone extending from Canada southward into the Texas Panhandle. This zone is located in the eastern part of the Great Plains, and therefore is not included in any of the major forest regions of our country. Although grass is the native vegetation of this region, trees are found in the valleys. But successful plantings of trees have also been made.

The Great Plains have suffered severely because of droughts, dust storms, and overextension of crop lands. Under the influence of high prices during the World War much land which would not be farmed under normal conditions was plowed for wheat and other crops. The greatly enlarged area of plowed land forced thousands of flocks of sheep and herds of cattle onto the poorer and still drier areas. These areas were quickly overgrazed and ruined. With the return of normal times much of the cultivated land was abandoned. Thus overgrazed districts as well as crop lands were exposed to the drying action of sun and wind. Abnormally low rainfall made matters even worse. Such conditions formed the breeding ground for destructive dust storms.

In July, 1936, a total of 1,278 miles of shelterbelt strips, with an average width of 10 rods, had been planted. More than four-fifths of the total shelterbelt plantings since the project began have survived.

QUESTIONS AND EXERCISES

1. Make a list of the ways in which forests are useful to us. Make another list of the different things that you use daily and which are made either wholly or in part of wood.
2. Name the major forest regions of the United States. Which of these regions originally covered the largest area?
3. What are the chief types of trees found in the Northern Mixed Forest? Why are most of these trees better suited for pulpwood and paper than for lumber?
4. What advantages has the South for the production of timber?
5. Describe the giant sequoias. How do these trees differ from the redwoods? Which of these types of trees are used commercially at the present time?

6. Trace the steps in the migration of the lumbering industry of the United States
7. How do logging methods of the Lakes States differ from those of the Pacific Forest Region? Why?
8. Give reasons why our Pacific Coast Forest region is able to compete with the Southern Mixed Forest, in spite of the greater distance to the chief consuming area in northeastern United States
9. What areas in the United States contain the greatest number of pulp and paper mills? Why are these areas important?
10. What are the chief materials used in the making of tannin? From what materials are the locally-produced tannins obtained? What is the chief foreign source of tannin?
11. What is meant by "naval stores industries"? Where do we obtain most of our naval stores products? What is the method used in obtaining these products?
12. Name the factors that have been chiefly responsible for the rapid decline of our forest reserves. What is being done at present to remedy this situation?

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TEXTILE INDUSTRIES IN THE UNITED STATES

COTTON MANUFACTURING

Developed by the ancients. The making of cotton cloth traces back to ancient beginnings. Many centuries before this industry was developed in Europe, the people of Egypt and the Orient made cotton fabrics. The Arabs brought cotton fiber (raw cotton) to Europe. It was called "qutun" by the Arabs, and from this Arabic term the word cotton was derived. During the Middle Ages cotton fabrics were taken regularly to Europe by Venetian and Genoese traders. They obtained cotton fabrics not only from Egypt but also from Mesopotamia, and India. The city of Mosul, Mesopotamia, was then an important cotton-manufacturing center. From Mosul the term "muslin" has been derived.

During early American history cotton cloth was obtained largely from foreign countries, even from the remote port of Calicut, India. The Indian cotton cloths purchased at Calicut were given the name "calicoes."

Invention of labor-saving machinery. The invention of labor-saving machinery for the making of cotton cloth was one of the most important steps in the development of our modern industrial age. In 1750 the manufacture of cotton cloth was much the same as it had been for a thousand years. Spinning and weaving were performed in homes and workshops. Then followed some inventions that were to revolutionize the industry. In fact, they ushered in a new industrial age for the commercial world. In 1764 James Hargreaves of Lancashire, England, invented the spinning jenny, which was the first machine to spin several threads at the same time. In 1768 Richard Arkwright, also of Lancashire, England, invented a machine that could spin a much larger number of cotton threads, of any degree of hardness or fineness. A few years later (1785) the Englishman, Edmund Cartwright, invented the power loom, which revolutionized the weaving industry. The hand-loom weavers, fearing that the new invention would throw them out of work, burned Cartwright's

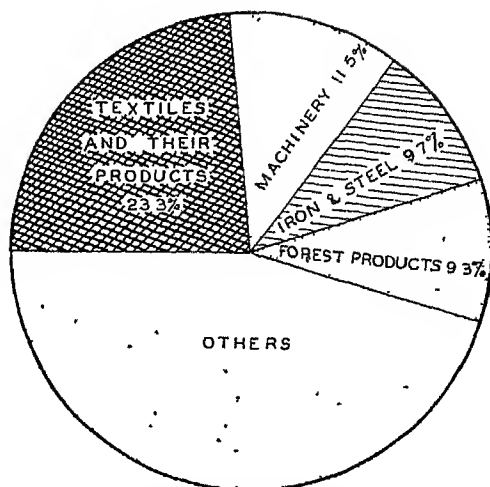
first weaving mill. These inventions gave the British a good start in the making of cotton cloth.

The machines invented for spinning and weaving increased the demand for cotton. But the raw material was still high in cost, because no machine had been invented to separate the seed from the cotton fiber. Then (in 1793) came Eli Whitney's cotton gin.

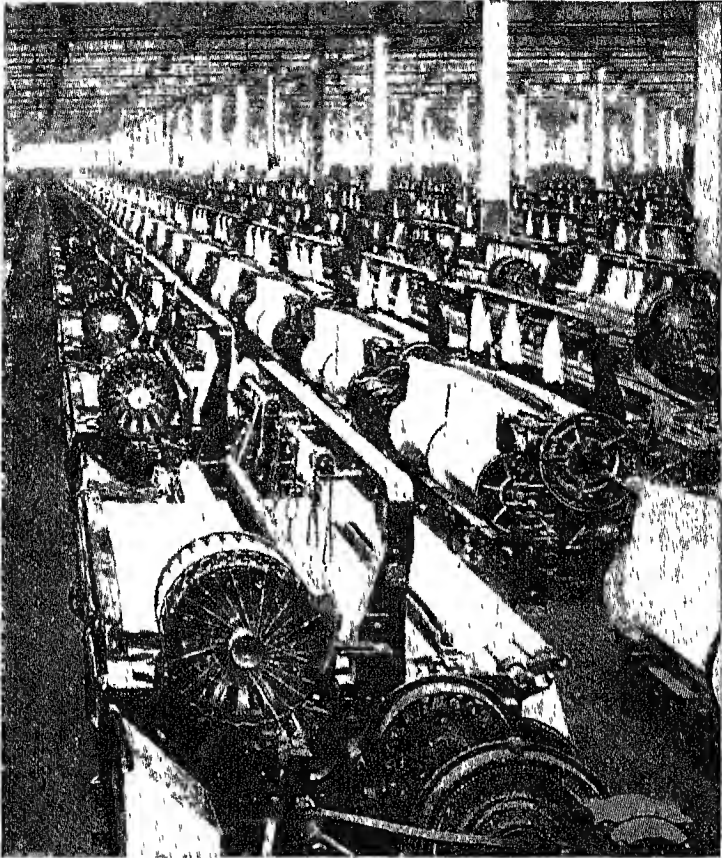
Importance of cotton manufacturing. For the world as a whole, about 50,000,000,000 persons would be required to do the work that is now done

by textile machines. The total population of the world is only 2,000,000,000. Large numbers of workers are nevertheless required in the textile industries. In the United States and western Europe textile industries employ more workers than are found in any other line of manufacturing (illus above). The making of cotton cloth is generally the leading type of textile industry. Even in China and India more people are engaged in the making of cotton cloth than in any other type of manufacturing.

Cotton manufacturing in New England. The first important cotton-manufacturing industry of the United States was developed in New England, but the development followed that in Great Britain. Although the cotton gin had been invented in America, the spinning and weaving machines were invented in Great Britain. Until 1825 the British forbade the export of textile machinery as well as models or drawings of such machines. In 1789, however, Samuel Slater, an employee of Arkwright's spinning mills, came to America. He taught workmen in New England how to build and operate spinning and weaving machines. Under Samuel Slater's direction our first cotton



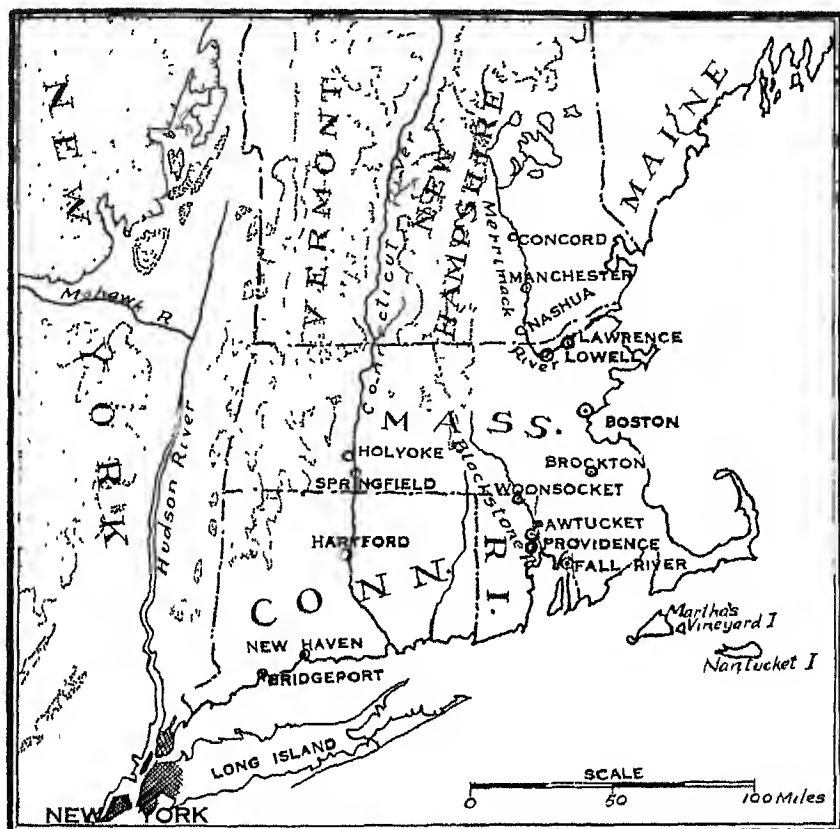
Major manufacturing groups in the United States. Graph shows percentage of industrial workers engaged in leading types of manufacturing. The textile group of industries employs more workers than does any other major type. This condition is also found in many other countries.



The interior of a cotton-weaving mill, showing modern machinery.

spinning mill was completed just before the year 1800, at Pawtucket, Rhode Island. Several other spinning mills were constructed during the following years; but weaving was still done by means of hand looms in the homes. In 1814 James Lowell installed the first practical power loom at Waltham, Massachusetts. From that time on, mill after mill was set up for spinning and weaving in various parts of New England. Most of the mills were built in river valleys where water power was present.

Chief centers of the industry Among the important cotton-manufacturing centers of New England are Lowell, Lawrence, New Bedford, Fall River, and Holyoke in Massachusetts; Manchester and Nashua in New Hampshire; and Woonsocket, Pawtucket, and War-



Chief textile centers of New England Note that many of them are located in river valleys The dotted areas of this map are more than 1,000 feet above sea level.

wick in Rhode Island. (See the map) These centers account for a large share of New England's total cotton-cloth output They make it possible for New England to rank as the second largest cotton-manufacturing region in the United States

Early start and water power in New England This region was the first important producer of cotton cloth in the United States. It has the advantage of an early start and long experience in the manufacture and sale of cotton textiles Much skilled labor has resulted from this long experience in making cotton goods.

Numerous water-power sites favored the industry The streams of New England contain many waterfalls. At the falls power is used

by the spinning and weaving mills. Fortunately, the streams of the area have a regular flow because of the uniform rainfall of the region. Moreover, New England contains many glacial lakes and swamps. These act as storage reservoirs, preventing rapid run-off after each rain. The waterfalls therefore provide a uniform power. But the cotton textile industry has outgrown the local sources of water power, and coal is increasingly being used.

Favorable location and moist atmosphere. The location of New England in regard to coal has become an advantage since the local water power has proved too small to take care of the textile industries. Although New England has no coal of her own, there are deposits in regions near by. Coal, cotton, and many other items can be handled cheaply because of the coastal location and the many good harbors of these states.

The moist atmosphere of the region favors the working of cotton fiber. In a dry atmosphere the fiber tends to break in the process of spinning. At the present time there are artificial means of controlling the temperature and moisture in the cotton mills, yet in spite of this artificial control, a region that has a naturally humid atmosphere has an advantage over drier areas in the making of fine cotton goods.

Manufacture of high-grade cotton textiles. New England has lost her supremacy in the total output of cotton cloth. The leadership has passed to the South. More and more of the coarse and medium-grade cotton goods are being manufactured in the southern states, which have abundant water power, cheap labor, and local supplies of cotton. But New England has retained the manufacture of high-grade cotton cloth. This region has also turned more to the making of ready-to-wear garments. In these activities New England is favored because of skilled labor and nearness to large consuming markets and the textile distributing centers.

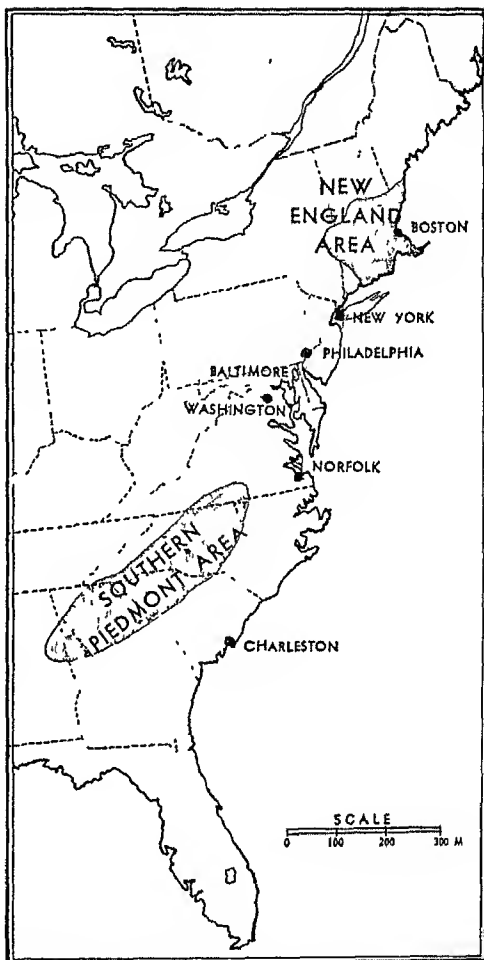
Cotton manufacturing in the South. The South has witnessed a remarkable growth in cotton manufacturing. Its mills consume about four times as much cotton as do those of New England. The southern mills are located largely in North Carolina, South Carolina, Georgia, and Alabama (Illus., p 227.) Many of these mills have been established in the Southern Piedmont Region because of the abundance of water power in that area. Many of them are also located along the main lines of southern railways.

A region of raw cotton production. Raw cotton is grown within this region. In some communities the cotton can be hauled directly

from the field to the gins of the cotton-manufacturing plant; but in many other areas of the South the cotton must be obtained from a distance. Some of the mills have outgrown the local sources of cotton, while others require a different type of cotton from that grown on the neighboring farms. Although the nearness to raw cotton is an advantage in some communities, other areas in the South have no marked advantage over New England in this respect.

It is noteworthy that many of the leading cotton-manufacturing countries of the world produce very little or no cotton, and that they must import cotton for their spinning and weaving mills. This condition is found in Great Britain, France, Germany, and Japan. The importance of cotton manufacturing is certainly not due to favorable location with respect to the cotton fields. Japan obtains much of its cotton from far-off United States and India. This fact suggests that other factors are more important than the raw material in determining the location of cotton manufacturing. That is also true in the South. Among these other factors are cheap and skilled labor and an abundance of cheap power.

Labor in the South. The South has an abundance of cheap yet



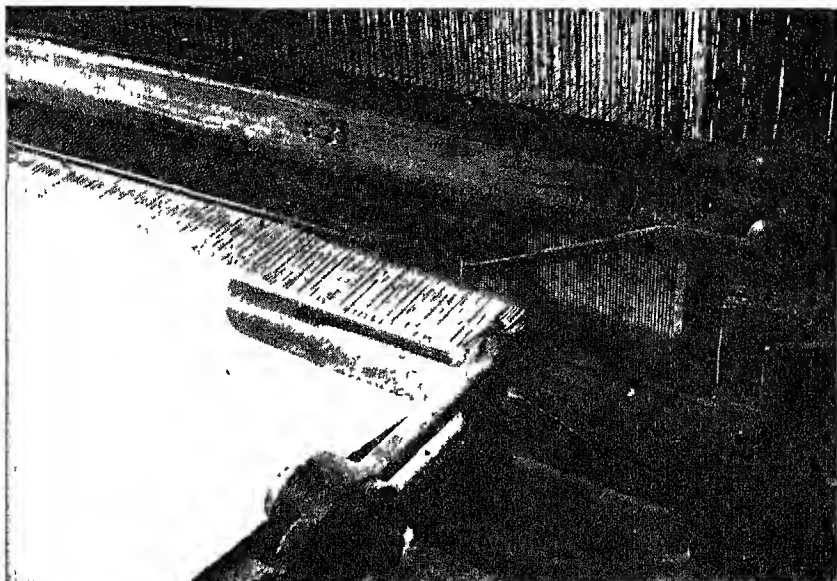
Two major regions of cotton textile industries in the United States—New England and the Southern Piedmont.

efficient labor. Because of the short, mild winters, the South requires but little fuel for the heating of homes. Houses can be built at lower costs than in the manufacturing centers of the North. The long growing season of the South makes possible the production of an abundance of cheap food. Under such conditions the workers can live quite cheaply. It has been estimated that southern labor can work for somewhat lower wages yet live about as well as the textile workers of the northern areas. Moreover, much cheap labor is drawn from the Appalachian Mountains, which lie just to the west of the Piedmont. The task of making a living is a difficult one in most of the Appalachian Highland areas. Some districts are inaccessible, and surplus crops could not reach outside markets because of high costs of transportation. From such areas the Piedmont textile mills have drawn some of their workers. These people have been better satisfied with work in the textile mills at low wages than on their small highland farms.

Power in the South. The South has an abundance of power—especially water power in the Piedmont area. Water power has been developed where streams drop from the hard rocks of the Piedmont Plateau to the softer materials of the Coastal Plain. That area is generally known as the “Fall Line.” Here electric power is generated and transmitted to numerous cities and towns located on the Piedmont Plateau. Electric power is also generated at the rapids of Piedmont streams, especially in V-shaped valleys of that highland area. Fortunately the water power is quite uniform from season to season because of the uniformity of rainfall and stream flow. In some areas coal is required to supplement the power of the streams. In the western part of the Cotton Belt, textile mills have been developed in areas of cheap mineral fuels. These western areas are devoted largely to the production of coarse goods and yarns.

MANUFACTURE OF WOOLENS AND WORSTEDS

An old industry in the United States. The people who first settled along our eastern seaboard brought with them sheep and a knowledge of how to make woolen clothing. The cotton gin had not yet been invented, and imported cotton clothing was very expensive. Thus the early American farmer made much use of wool clothing for himself and his family. Moreover, such clothing helped the inhabitants withstand the rigorous winters.

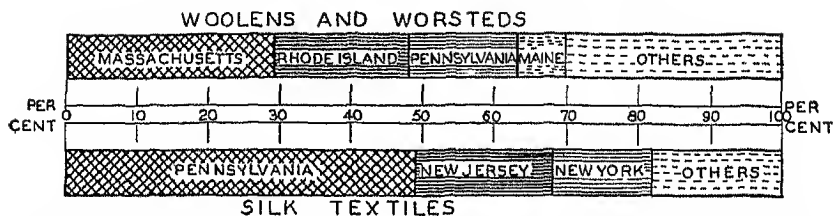


Weaving wool cloth. The shuttle of the loom has just gone through the warp. The next movement of the loom is to push the single thread forward against the preceding one. (Courtesy Associated Wool Industries.)

The manufacture of woollens was a household industry during our colonial period. The industry is therefore somewhat less concentrated than the manufacture of cotton. It became concentrated (in cities and town) as modern machines were introduced.

Largely a New England industry. New England is the leading region in America in the production of woollens and worsteds. Through Boston, the leading wool market of the New World, flows over two-thirds of all the wool consumed in the United States. About three-fifths of all the workers in the United States engaged in the manufacture of woollens are employed in New England. Of the New England states, Massachusetts is the leader in this industry (Illus , p 230) Here Lawrence, Holyoke, and Lowell are the chief wool-manufacturing centers. Providence and Woonsocket are the main centers in Rhode Island.

New England's high rank in the manufacture of woollens is due largely to its early start, skilled labor, and its favorable location for the import of raw wool and the export of the finished product. Water power also helped the industry develop. The numerous scattered waterfalls and rapids furnished power. But at present the industry



Study this graph. Note the central part which is marked from 0 to 100 per cent. Above are shown the states that lead in woolen and worsted manufactures, below are the states that lead in silk manufacturing.

is more concentrated at the larger power sites in southern New England. At Lawrence, Massachusetts, the leading woolen-manufacturing center, large falls in the Merrimack River supply much of the power that is used. Moreover, coal is used to supplement water power at various of the textile centers. Southern New England is conveniently located for purchasing coal.

Type of wool affects manufacture. Although there are many different kinds of wool, they may be grouped into three major types: (1) the fine, short-staple clothing wools used in the making of woolen cloth; (2) the long-staple wools used in the worsted manufactures; and (3) the short, coarse wool of low grade used in making rugs and carpets.

Most of the mills are engaged in the manufacture of wool clothing, yet the total value of worsted manufactures surpasses that of woolens. Worsted are used in large quantities in the making of men's suits. Worsted require longer wool than is used in making wool cloth. Generally the wool is combed before it is spun. The shorter wool is combed out, leaving the longer staples for the manufacture of worsteds. Wool for the making of woolens and worsteds is obtained largely from merino sheep.

Short, coarse wool of low grade is used in making rugs and carpets. Philadelphia is the most important rug- and carpet-manufacturing city in the United States. Here large quantities of short, cheap carpet wool are obtained from China and southwestern Asia.

SILK AND RAYON MANUFACTURING

The United States imports its raw silk. Although the United States is the world's leading producer of silk textiles, all of the raw material is imported. Attempts have been made to introduce silk-

worm culture into the United States and produce raw silk at home. But these attempts have ended in failure. It is now a well recognized fact that silk culture is profitable only where there is an abundance of cheap labor and suitable conditions for the growth of mulberry. In the care of the silkworms and the preparation of the raw silk much patient attention is required. The United States therefore imports its raw silk mainly from Japan and China. It is normally one of the leading items of our country's import trade. The raw silk is sent to our Pacific ports and from there across the United States on express trains.

Silk mills located mainly in northeastern United States. There are hundreds of silk mills scattered through many states, yet most of them are located in a comparatively small area. Pennsylvania, New Jersey, and New York, are the leading states in the manufacture of silk textiles (Illus, p 230). Together they account for more than three-fourths of the total value of silk goods produced in the United States, and they contain nine-tenths of the silk mills. The chief city in this type of manufacture is Paterson, New Jersey. It is America's most distinctive city in the silk-goods industry; just as Lyon is important in France and Krefeld in Germany. At Paterson, New Jersey, the Passaic River furnishes an abundance of power and clean water for the making of silk textiles.

Advantages of Pennsylvania, New Jersey, and New York in silk manufactures. These states are favored with an abundance of labor, large consuming markets, and excellent transportation facilities. In many districts the women work in the silk mills, while the men are employed in the heavy industries, such as iron and steel plants. In a number of the coal-mining towns of Pennsylvania a large number of the women workers come from the families of miners. These states are located within America's largest area of dense population. There are consequently many excellent markets for the finished products. In addition, rail and water routes converge upon these states, and the finished products are easily distributed to other regions.

Products of the silk industry. Nearly one-half of the silk cloth made in the United States is used for dress goods. Silk is also used in the manufacture of ribbons, hosiery, upholstery materials, and silk velvets. The tough fabrics of parachutes and balloons are also commonly made from silk.

Rayon, a late-comer among textiles. The last of the major contributions to the field of textiles is rayon or artificial silk. The recency

of rayon among the textiles is indicated by the fact that the first rayon mill was erected in France in 1889. Here a factory was built by the French scientist, Chardonnet, who discovered the method of making rayon. He took out a patent on his process in 1884.

Chardonnet had observed the manner in which silkworms formed a gumlike substance out of the mulberry leaves that they ate and forced that substance out through two tiny holes called spinnerets. Thus the silkworm, in covering himself with fine threads, gave Chardonnet the idea of making silk artificially. Chardonnet therefore dissolved mulberry leaves in a certain acid. He then forced the mixture through tiny holes in a small instrument constructed for that purpose. His experiment proved successful. He later found that the fiber of the wood of the mulberry tree gave just as good results as the leaves. Later discoveries showed that the wood of other trees could also be used. Just think of it, beautiful silk made out of wood! Today most of the wood used for the making of rayon is obtained from spruce.

Raw materials used in the manufacture of rayon. Although four-fifths of the world's rayon is made from wood pulp (chiefly spruce), other raw materials are also used at present. Most important of these raw materials are specially-bleached cotton and cotton linters (small fuzzy fibers covering the cotton seed). There is also a tendency to mix wood pulp with cheap short-staple cotton and cotton linters. The kind of raw material used is governed largely by the method or process employed in the making of rayon. There are four major processes, the viscose being the most important. In this process spruce wood is the chief raw material. It is treated with chemicals, made into a syrup-like mixture, then forced through tiny openings into an acid bath where the fine threads harden.

In the making of cellophane, a similar syrup-like solution is used. But instead of being forced through small holes or spinnerets, it is forced through narrow slits, thereby forming thin sheets, and the chemical treatment is different from that given rayon.

The United States, the leading producer of rayon. Although the first process of rayon manufacture was invented in France, the United States is the leading producer at the present time, producing from one-fourth to one-third of the world's rayon.

Within the United States most of the rayon mills are located in southern New England, in eastern Pennsylvania, and in New York.

City. These areas have large markets, an abundance of labor, and chemical plants. In these areas other textile industries were already established before the introduction of rayon. In the districts of the rayon mills it is also necessary to have an abundant supply of pure water. Location with respect to the raw materials (pulpwood, cotton, etc.) is of minor importance. As compared with cotton or woolen textile industries, the rayon industry consumes relatively little raw material. The cotton textile mills of the United States normally consume nearly 1,500,000 tons of raw cotton, while the rayon output of our country is little more than 100,000 tons. Most of the wood pulp used in the making of rayon in the United States is spruce imported from Canada.

Rayon competes with silk. In some respects rayon is superior to silk. Pure rayon will not shrink or become yellow. Yet moisture weakens it and there is a tendency for the rayon fabric to stretch unless it is washed correctly. It will not wear quite so well as silk. Rayon is therefore commonly mixed with other textiles, such as cotton, to produce fabrics that combine silky luster with strength.

One of the greatest advantages of rayon is its low price. The production of rayon has therefore increased remarkably, until at present the world produces more than four times as much rayon as silk. In the United States the consumption of rayon is about three and one-half times that of silk.

THE MAKING OF WEARING APPAREL

Chiefly centered in the larger cities. The production of wearing apparel or ready-to-wear clothing is largely a factory enterprise in the United States. On the other hand, in most other parts of the world this type of manufacturing takes place in workshops and in the homes. Even in Europe much of the clothing is made to order by dressmakers and tailors. In the well-known fashion trade of Paris, garments are generally made in homes and small shops, although the patterns are worked out by expert designers.

In the United States the chief centers engaged in the ready-to-wear clothing industry are New York, Chicago, Philadelphia, Rochester, N. Y., and Boston. New York is the giant of them all. This city contains more than one-half of all the workers in the United States engaged in the making of women's clothing, and nearly one-fifth

of those employed in the making of men's clothing. Like Paris, New York is the major center in which new styles are developed. Moreover, it is a great market for clothing and a major distributing center for finished products. It also contains an abundance of skilled labor.

QUESTIONS AND EXERCISES

1. Give reasons why the cotton textile industry was slower in developing in New England than in the United Kingdom.
2. On a sketch map of New England place the names of the chief manufacturing centers. Why did many of these centers favor the development of the cotton textile industry in New England?
3. Why has cotton manufacturing made rapid progress in the Southern Piedmont? Give reasons.
4. How does New England differ from the Southern Piedmont in water power and the character of its labor supply?
5. Name five of New England's wool-manufacturing centers. How important is New England in the manufacture of woolens and worsteds?
6. What factors aided the development of wool manufacturing in New England?
7. What importance has type of wool upon the kind of finished product that is manufactured?
8. Why does the United States import its raw silk? Why not produce our own?
9. Name the leading states in silk manufacturing. What factors have favored the industry in these states?
10. What is rayon? From what is it made? To what extent does it compete with silk?
11. What cities of the United States lead in the manufacture of wearing apparel? Why?

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Fundamental to modern industry. If all of the gold and silver of the world were destroyed, man's activities would go on almost unchanged. True, such a loss would interfere with trade for a time, and some minor industries would be momentarily at a loss to find substitutes for these precious metals.

If, on the other hand, our iron supply were suddenly cut off, modern industrial civilization would be destroyed. From the time we arise in the morning until we arise the next morning, we make use of iron almost continuously. The razor blade with which a man shaves is made of steel. His breakfast is cooked on an iron stove, his home is heated with an iron or steel furnace, he goes to his office in a street car or automobile made largely of iron; and in a similar manner he uses iron products all day, and finally sleeps on steel springs at night. Hundreds of thousands of iron and steel products are made every day. They vary greatly in size, from the tiny hair spring of a watch to huge battleships, steel bridges, steel frames of skyscrapers, and steel pipe lines, some of which are more than 1,000 miles long. Together, they are fundamental to modern industry.

How many things can you think of that you have used today that were neither made of iron nor by the aid of this metal? After you have given some thought to this question you will probably be convinced that if we were to do without iron our mode of making a living would revert to one more simple than that of the early colonists.

Source of iron and steel. Iron is one of the most abundant elements of the earth's crust, but most of it is so widely distributed throughout the rock and soil that man cannot profitably obtain it. Within a few small areas iron represents 30 to 70 per cent of the rock. This concentration of iron in various parts of the earth's crust has greatly simplified the problem of obtaining the metal. Wherever the iron content of rock is sufficiently high to give it present or potential economic value it is called *iron ore*. The iron supply of the world is obtained by separating the iron from the other minerals contained in iron ore. It will be noted later that even the manufactured product—iron—is not entirely free from impurities (other minerals).

Steel is a man-made product and is never produced by nature. It is manufactured by heating iron in the presence of charcoal, coke, or anthracite coal until it has absorbed a definite amount of carbon. The product also receives special treatment which makes it hard and tough.

Why iron is so useful. Iron can be made to take on more properties than can be imparted to any other metal. This is especially true when iron is made into steel. The latter product can be given a cutting edge with any degree of sharpness needed, as in the case of razor blades, knives, saws, axes, and lathes. It can be made strong, tough, and relatively rigid, as in the case of railroad rails; or it can be made exceedingly flexible, for use in the manufacture of springs needed for thousands of purposes. It may be made extremely tough, especially when alloyed with nickel, so as to withstand terrific shocks. Battleship armor is perhaps the best example of steel having this quality. It may be given great strength, or it may be made brittle. It is ductile, that is, it may be drawn into wire. Finally, by the use of an electric current iron may be given magnetic power.

This last characteristic of iron has had far-reaching influences in recent industrial development. It is this magnetic property of iron that enables man to make the great dynamos which generate electricity. Today we are dependent upon this characteristic of iron for the economic and large-scale production of electric energy with which we light our homes, operate electric street-railways, and drive much of the machinery of our factories. Thus, iron is indispensable for the promotion of practically every major development associated with and following the Industrial Revolution. It is essential to the harnessing of power, to the creation of cheap electric power, and to the manufacture of machinery and tools.

STAGES OF IRON AND STEEL MANUFACTURE

Early origin. Man has known how to make iron for three or four thousand years, and has been making steel for more than a thousand years. The use of iron first became common in the early days of the Roman Empire. The smiths of that time used it to make nails, bolts, hinges, keys, chains, swords, spears, and hooks. When Caesar arrived in Britain in the first century before Christ, he found the natives using iron weapons and simple iron implements.

Raw materials and distribution during the early period. During the early stages of iron and steel production, iron ore and charcoal constituted the major raw materials that were used. The methods of manufacture were primitive, and a great amount of human effort was expended to produce a few hundred pounds of iron or steel. Under such conditions small deposits of iron ore were just as well suited to the promotion of the industry as deposits of billions of tons would have been. A few hundred tons of iron ore would supply an iron and steel manufacturer for years. Such small deposits of iron ore were widely scattered over the face of the earth. Hardwood forests needed for the manufacture of charcoal were also widely scattered. Small iron and steel industries sprang up wherever people had sufficient energy and knowledge to carry on the work. Consequently the distribution of the early industry was closely related to the industrial abilities of the people. The higher the industrial civilization of a people, the more iron and steel they produced.

Early growth of iron and steel industries. The iron and steel industry developed around the eastern borders of the Mediterranean Sea, when that region had achieved a pre-eminent position among the civilized peoples of the world. The centers of greatest production gradually shifted to western Europe, with the shift in industrial leadership. Later this leadership, both in industry and in iron and steel manufacture, was shared by eastern United States.

As compared with the Mediterranean Region, the factors favoring western Europe were the superior energies of their peoples and the greater productivity of their land. In Chapter 2, p 27, it was pointed out that western Europe has one of the most invigorating climates in the world. In Chapter 19, pp 347 and 348, we will learn that the land is productive. These two factors—active peoples and productive land—are basic for the building up of markets, not only for iron and steel products, but also for a great variety of other commodities. Western Europe was also blessed with numerous deposits of iron ore and with an abundant supply of hardwood forests for the manufacture of charcoal. All of these factors favored the manufacture of iron and steel products. Consequently Spain, France, Belgium, Germany, Sweden, and England all had developed iron and steel industries even before the colonization of the United States. Perhaps Toledo, Spain, famous for its swords, and Sheffield, England, famous for its cutlery, were the most noted of these early European steel manufacturing centers.

As the American Colonies grew it was discovered that their advantages for iron and steel production were similar to those of western Europe. Our colonists were energetic and progressive, and the land and sea yielded an abundance of products. The American colonists needed nails, hinges, tools, wagon and buggy tires, guns, kettles, stoves, and iron for shipbuilding. Small deposits of ore were widely scattered in the eastern portion of the United States, and hardwood forests furnished an abundance of wood for the manufacture of charcoal. Consequently all of the early colonies except Georgia had bloomeries (small iron manufacturing plants). For many years Massachusetts led in iron and steel output. That colony was favored with numerous pockets of iron ore (only a few hundred or at most a few thousand tons of ore in any one place), a fair supply of wood, and a demand for iron in the building of ships and in the manufacture of agricultural tools and machinery.

Early methods of iron manufacture. Iron is extracted from the ores by burning or melting off the impurities. During the earliest period of iron manufacture a hearth or forge was made in such a manner that air could be forced through it by bellows similar to those used by the blacksmith today. Later this forge was made larger and the bellows made stronger. Finally the bellows, which formerly had been worked by hand or foot, were operated by machinery and the air was forced through the furnace so rapidly that it was called a *blast*, and the furnace became a *blast furnace*. This furnace melted the iron into a liquid which was run off into molds, where it cooled into iron bars called *pigs*. The resultant product is therefore called *pig iron*.

The pig iron contains so many impurities that it is brittle. In the early days much of the pig iron was melted again and this time stirred, in order to burn out more of the impurities. The resultant product, *wrought iron*, is tougher and stronger than pig iron but is inferior to steel.

Early developments of steel industries. Several hundred years ago men learned how to make steel by a method known as the *cementation process*. In manufacturing steel by this process, iron is cut into small chunks of a pound or two each and packed with charcoal in an air-tight box. The entire box is then kept at red-heat for a few days. During this period the desired amount of carbon is absorbed by the iron, which is thereby transformed into high-grade

steel No process of steel manufacture has ever been devised by which a better grade of steel can be produced It can readily be seen, however, that a great amount of human effort is required to make a few pounds of steel by such a method, and that the product must of necessity be exceedingly expensive Moreover, such steel could not be produced in sufficient quantities for the building of railroads, locomotives, ships, and heavy machinery

Depletion of charcoal supply. During the twelfth and thirteenth centuries the forests of England and of western Europe became the greatest centers of the iron industry In 1282 there were 72 iron forges in the Forest of Dean, England By 1580 England was passing laws prohibiting or restricting the use of charcoal for the manufacture of iron At the beginning of the eighteenth century the American colonies were increasing their production of iron by the aid of the virgin forests of the New World, whereas in England the iron industry was being crippled by a shortage of fuel By 1740 England, because of restrictions placed upon the making of charcoal, was compelled to import iron from the American Colonies and from Germany.

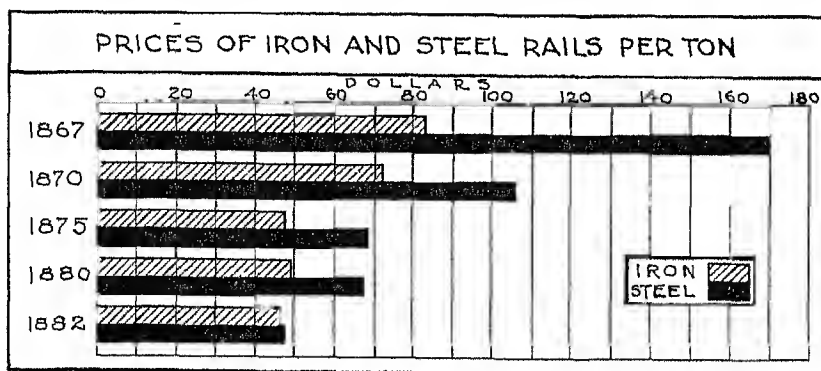
Substitutes for charcoal. By 1830 the development of the Industrial Revolution created such a demand for iron and steel that the charcoal supply of western Europe and eastern United States was in danger of being exhausted The need for a more abundant supply of fuel led to successful experimentation with anthracite coal, and with coke as substitutes for charcoal.

Changes in fuel brought changes in location of industry. The change in the type of fuel used, resulted in a redistribution of the iron and steel centers. Prior to 1830, the greatest centers of production within the United States were located near the eastern seaboard. Gradually, the industries were shifted to the anthracite coal field of eastern Pennsylvania, where Fulton, Bethlehem, Scranton, Reading, and other cities of the district became famous for their steel works. By 1856 the anthracite coal region had become the greatest iron and steel center of the United States Later the supremacy in iron and steel production was shifted to western Pennsylvania, famous for its high-quality coking coal. Similarly, during this period the iron and steel industries of western Europe were being shifted from the hardwood forests to the coal fields.

RECENT DEVELOPMENT OF THE IRON AND STEEL INDUSTRY

The iron age. Iron has been of such great importance to civilization since the middle of the thirteenth century that the period from 1250 to approximately 1870 may be properly called the iron age. It was the discovery of an abundant fuel supply, however, that removed the immediate danger of the exhaustion of raw materials and accelerated the iron industry tremendously. With a plentiful supply of excellent fuel assured, the iron production of the world jumped from 1,825,000 tons in 1830 to more than 7,000,000 tons in 1856. This increase was needed to supply the rapidly mounting demands that resulted from the Industrial Revolution. During this period, however, steel production did not increase much because the *cementation process*, still in use, required a great amount of human effort in order to produce a few pounds of this metal.

The steel age. In 1856 Sir Henry Bessemer of England discovered a new process for steel manufacture that was destined to revolutionize the iron and steel industries. By this process many tons of iron may be turned into steel within 10 or 12 minutes. Within a few decades after this discovery the production of steel had increased a thousandfold. During the same period the price of steel declined rapidly. Steel rails (for railroad building) soon replaced the brittle and unsatisfactory iron rails and steel replaced iron in the manu-



In 1867, shortly after the Bessemer process of steel manufacture was invented, steel rails sold for \$170 a ton, but within fifteen years the process had been improved to such an extent that the cost of steel rails had declined to less than \$50 a ton.

facture of many types of machinery This new type of steel produced by the Bessemer process had its disadvantages. It was adapted only to the use of pig iron made of relatively high-grade ore, and, moreover, it was not high-grade steel In fact, Bessemer steel is still manufactured and is still a relatively low-grade product

Bessemer process fulfills need for quantity The Bessemer process was invented at just the time when the Industrial Revolution was beginning to expand rapidly, and consequently when increasing quantities of steel were needed But for this timely discovery the Industrial Revolution would have been stunted in its early growth At that time, it was not necessary that the quality of steel be of high grade Locomotives were still small, loads were relatively light, and we had not yet reached the age of speed Thus a relatively poor grade of steel fulfilled most of the needs for this metal during the early stages of the Industrial Revolution

By 1880, industry was beginning to demand bigness and speed The sizes of the locomotives were being increased each year, freight cars were being built to carry heavier loads, the spans of bridges were being lengthened, and many types of machinery were being geared to constantly increasing speeds All of these changes were placing an increasing strain on steel machinery, steel rails, and steel bridges The new demands on steel were such that an improvement in the quality of the product was becoming as necessary as an increase in quantity had been a few decades earlier Unfortunately, the Bessemer steel was relatively poor in quality, and was no longer suited to all of the needs of industry Under the strain imposed by the great weight and high speed of the locomotive, Bessemer steel sometimes broke without warning

Other processes fulfill need for quality Fortunately as soon as there was a pressing need for a large amount of high-grade steel, a method of manufacturing it was discovered In 1883 the invention of the open-hearth process made it possible to produce large quantities of high-grade steel out of low-grade ore Although open-hearth steel is somewhat more expensive than Bessemer steel, the former is now made in much larger quantities than the latter.

During the early part of this century a German scientist devised an electric process for the manufacture of steel By this method the heat of the furnace can be controlled with great precision The electric furnace is used primarily for the manufacture of especially high-grade alloys The cost of such steel is too high for general use,

and the output is small. Most of the steel alloys are still made by the open-hearth process, but alloys of especially high quality are produced by the more expensive electric process.

Steel alloys Practically all of the steel manufactured in the United States is alloyed (mixed) with minor quantities of other metals in order to give the product some particular qualities which pure steel does not possess. The most important of our alloys is manganese. Small quantities of this metal, alloyed with steel, give it added qualities of toughness and resistance to rust. On the average, approximately 14.3 pounds of manganese go into each ton of steel that is manufactured within the United States.

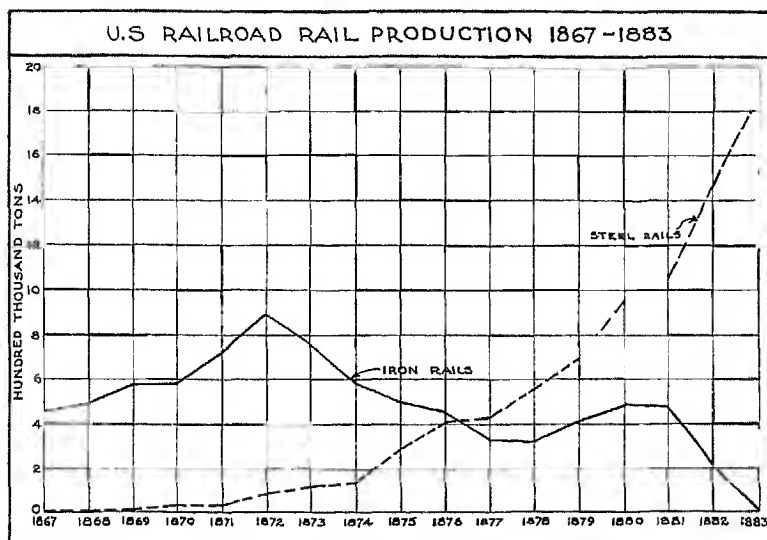
Chromium is another steel alloy of great importance. The use of chromium increases the resistance of steel to rust and wear, and also gives it increased hardness, toughness, and strength. When 20 to 25 pounds of chromium are added to a ton of steel, the product is known as stainless steel and is useful in the manufacture of valves, restaurant equipment, porch chairs, chemical instruments, certain automobile parts, and literally hundreds of other products.

Tungsten, another metal used in steel alloys, is considered almost indispensable to modern industry. Tungsten steel has a high melting point and is hard and tough. Such qualities are essential in high-speed cutting tools, where a sharp edge must be maintained while the machine is operating so rapidly that the temperature reaches red-heat, which would melt ordinary steel. Since tungsten steel is resistant to heat, more than 90 per cent of the tungsten used in the United States goes into the manufacture of high-speed cutting tools.

Nickel, vanadium, and molybdenum are other important steel alloys. Nickel imparts many valuable qualities to steel. It increases the durability, toughness, and tensile strength of steel, making it especially desirable for the manufacture of guns and of armorplate for battleships. It is therefore a coveted product in preparation for war.

Only a few of the steel alloys are mentioned here. At present a single steel company has formulas for thousands of steel alloys, each one of which has its specific use.

Steel replaces iron in industry The importance of the discovery of new processes of steel manufacture is indicated by the fact that in 1855, the iron production of the United States was probably several thousand times as large as our steel output. In 1870, fifteen years after the Bessemer process was invented, approximately 4 per cent of the pig iron of the United States was made into steel; by 1880 about 30 per cent of the pig iron was reduced to steel; whereas

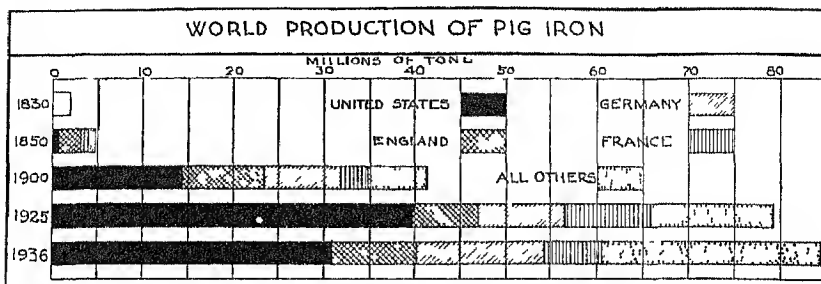


Soon after the invention of the Bessemer process of steel manufacture, steel rails began to replace the more brittle and less satisfactory iron rails. By 1883, the locomotives were so heavy and moved so swiftly over the track that the iron rails were no longer safe and their production ceased.

since 1910 nearly all of the pig iron has been used for the manufacture of the more finished product—steel. The annual output of our steel mills now exceeds that of our blast furnaces (pig iron manufacturing plants). (Graph above.) This development is made possible by annually adding millions of tons of scrap iron and scrap steel to pig iron in the manufacture of new steel. Although steel has been made for perhaps a thousand years, it was Bessemer who really initiated the steel age, and it was the invention of the open-hearth and the electric furnaces, together with the discovery of the method of making thousands of steel alloys, that has made possible the development of the steel industry to its present state of importance.

PRESENT DISTRIBUTION OF IRON AND STEEL PRODUCTION

Importance in countries bordering North Atlantic. It is an interesting fact that during the past century more than 90 per cent of the iron and steel output of the world has been produced in countries tributary to the North Atlantic Ocean. Indeed, during most of this period four countries—the United States, England, France, and



During a large part of the past century, four countries—United States, England, Germany, and France—have produced more than 90 per cent of the world's production of both pig iron and steel. During recent years the pre-eminent position of these countries is being threatened by Russia.

Germany—have been responsible for the production of 80 to 85 per cent of the world's total output. For a time England manufactured more steel than was produced by all other countries combined. In 1925, this same distinction was attained by the United States. (Chart above.) Western Europe and eastern United States have every advantage for the manufacture of iron and steel. Their climates are invigorating, their soils productive, and their peoples energetic—conditions which are conducive to the development of large markets. These regions also possess vast resources of coal, iron ore, and limestone—raw materials for the manufacture of iron and steel. Nevertheless, some countries are more abundantly blessed with raw materials than others. Countries like the United States, England, Germany, Belgium, France, and Russia, which possess both coal and iron, have a tremendous advantage, for the production of iron and steel, over the ones that do not possess these raw materials. Countries like Sweden and Spain, which have an abundance of iron ore but little or no coking coal, are less fortunate in this respect. So, also, countries like China and Australia, rich in coking coal but poor in high-grade iron ore, find the struggle to overcome this shortage a difficult one. Countries that possess neither coal nor iron ore are almost hopelessly handicapped in the present race for industrial greatness.

THE IRON AND STEEL INDUSTRIES OF THE UNITED STATES

A nation rich in iron ore and coking coal. The United States is particularly favored for the production of iron and steel. It possesses enormous quantities both of high-grade iron ore and of

excellent coking coal No other country is so richly endowed with both of these essential raw materials for the manufacture of iron and steel Moreover, the largest deposits and the finest grades of both of these minerals are located in the eastern half of the country and are, accordingly, close to the densely populated regions of both the United States and Canada

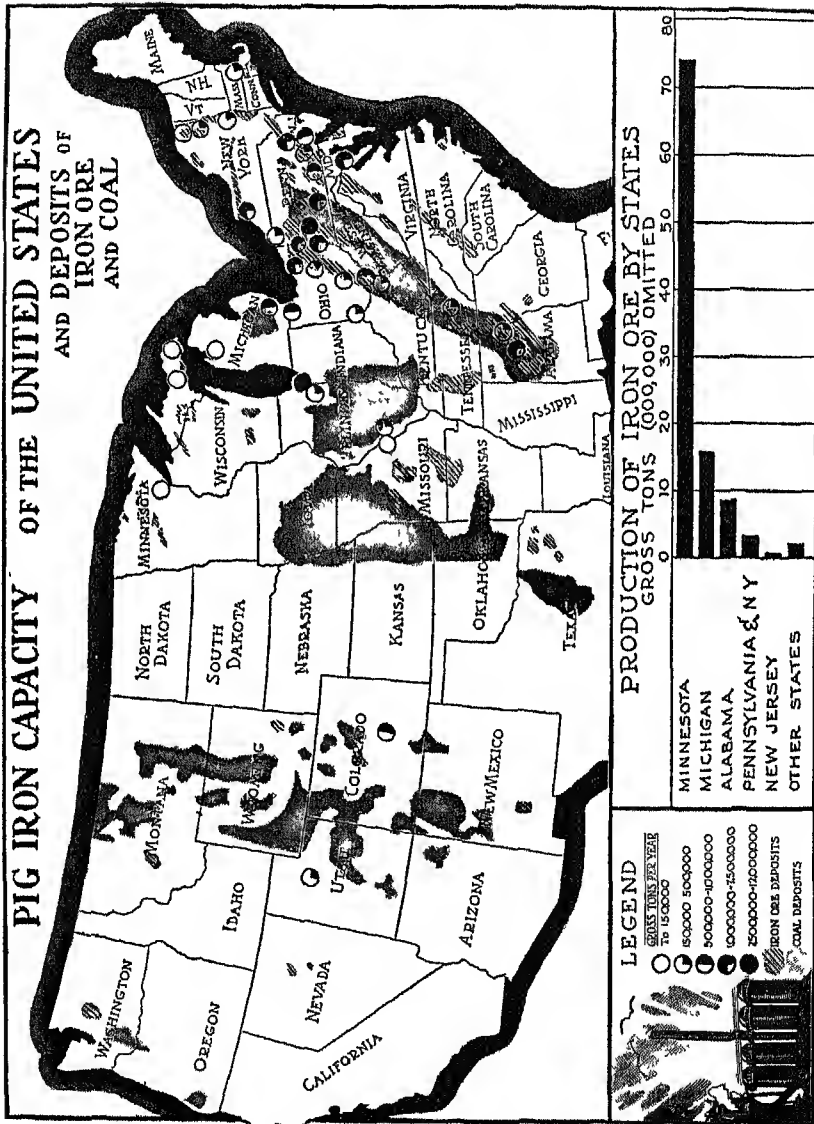
Distribution of iron ore Most of the high-grade iron ore possessed by the United States is found in two areas (1) the Lake Superior District, and (2) the Birmingham District in Alabama Although other minor iron ore deposits are scattered throughout the country, 94 per cent of our total iron ore output comes from these two regions (Illus, p 246) Originally, these two areas contained more than 6,000,000,000 tons of medium to high-grade iron ore Since more than 2,500,000,000 tons have already been utilized, the quantity of high-grade ore remaining is approximately 3,500,000,000 tons, and more than 40 per cent has already been used.

United States becomes leading iron- and steel-producing country of the world. Soon after the War between the States the steel industry of the United States began to expand rapidly, and, except for setbacks, continued to expand until 1929

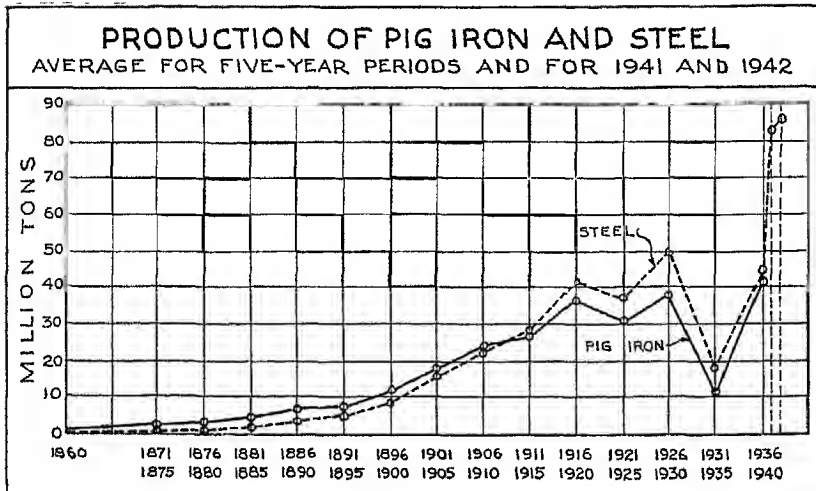
About 1870 the United States launched forth on the most rapidly expanding railroad-building program that the world has ever experienced Shortly thereafter the manufacturing industries of this country were developing with remarkable rapidity, and the farmers were demanding increasing quantities of labor-saving machinery Millions of tons of steel were needed to satisfy these demands During the early eighties, the United States gained leadership over all other nations in the production of iron and steel products, and has maintained this leading position ever since.

Thus we have seen how the foundations were laid for the tremendous expansion of the iron and steel industry which took place in the United States between 1867 and 1929. In summarizing the major advantages for this development we find them to be (1) the possession of vast resources of iron ore and coking coal, (2) the use of the newly discovered Bessemer, open-hearth, and electric processes of steel manufacture, and (3) the rapid expansion of railroad building, factory development, and agriculture, all demanding increasing quantities of iron and steel It should also be remembered that basic to all of these developments are the facts that eastern United States has an invigorating climate and a productive soil, and is occupied by energetic peoples

PIG IRON CAPACITY OF THE UNITED STATES AND DEPOSITS OF IRON ORE AND COAL



One cannot judge the importance of an iron-ore deposit by its size as indicated on a map. The small iron-ore producing areas of northern Minnesota are the most important iron-ore mining regions in the world. Most of the pig iron is produced in the northeastern part of the United States, close to the market. Data for pig iron, 1940, for iron ore, 1942. (Courtesy American Iron and Steel Institute)



Soon after the War Between the States the demand for iron and steel products began to increase rapidly, and, with minor exceptions, the increase continued until 1929. During the next five years, because of a world-wide depression, the production fell off sharply. Recently, as a result of the Second World War, production has risen to unprecedented heights.

Iron mining in the Lake Superior District. The ancient rock near the western end of Lake Superior contains some of the finest iron ore deposits which exist anywhere. (Illus, p 248.) For several decades the iron mines of this district have been the most productive ones in existence. They produce nearly one third of the iron ore of the world and more than 80 per cent of the output of the United States. Although rich ores are widely scattered throughout a large part of northern Minnesota, the upper peninsula of Michigan, and northern Wisconsin, the Mesabe Range in Minnesota is the chief producer, and yields more iron than all other mines in the United States combined. The Second World War has created a tremendous demand for iron ore. At the present rate of production, the high-grade iron ores of the Lake Superior Region will be gone within a few years.

Open-pit mining The Mesabe Range contains an abundance of high-quality ore which lies near the surface. Much of it is covered by only a thin mantle—10 to 50 feet of loose sand and gravel—which may be quickly and cheaply removed by steam or electric shovels. Once this task has been accomplished, an ore body, tens or even hundreds of feet thick, lies exposed and ready for exploitation. The



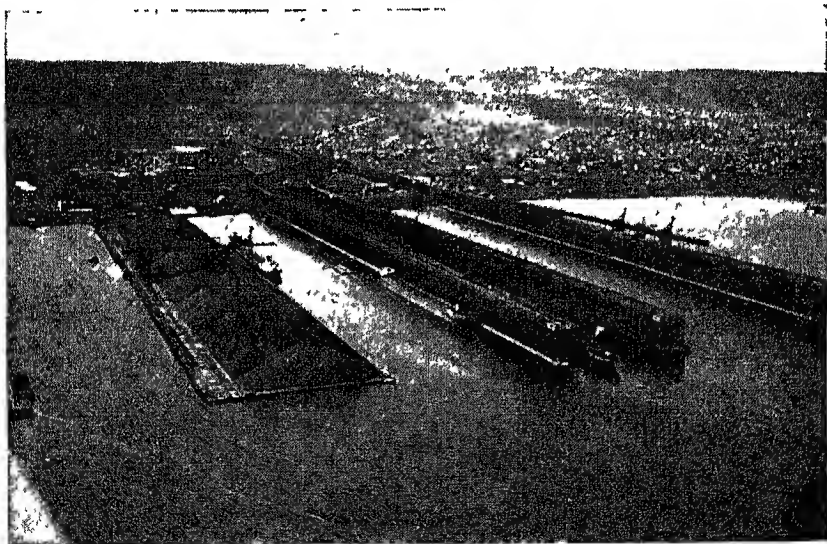
Many tons of iron ore are mined daily by giant steam or electric shovels. *Below*, a closeup of one of the electric shovels scooping up several tons of ore before dumping it into the freight car. (Courtesy Duluth Chamber of Commerce)

ore can then be mined by giant steam or electric shovels which scoop up 10 to 20 tons at a time and dump it into freight cars. Such a process is known as open-pit mining, which characterizes the activities of the region at present.

Shaft mining. Some of the iron ores of the Lake Superior District, and practically all of those in other parts of the United States, lie deep underground where they can be reached only by sinking deep shafts. Such a process of recovering the ore is more expensive than that used in the open pit. Thus in 1933 the average cost of developing and mining ore in the open-pit operations was \$1.12 a ton, whereas the cost in underground mines was \$2.08 a ton.

Transportation. Most of the ore of the Mesabi District is assembled at Virginia, Minnesota, near the eastern end of the most important iron ore deposits. From there it is taken to Duluth in long trains which run down a gentle slope all the way to the wharves situated on the shore of Lake Superior.

At the wharves in Duluth the trains pass over a high trestle and the ore is automatically dumped into bins below. From these bins the ore is loaded through chutes into ships that are brought into position at a level lower than that of the bins. (Picture below.) Modern



Iron ore docks at Duluth. At the central docks trainloads of ore are dumped into bins from which it flows into the lake steamers. Ten thousand tons of ore can be loaded into a ship within a few hours. (Courtesy Duluth Chamber of Commerce.)

machinery, then, is used in practically every operation of mining and marketing the iron ore. The ore is mined, transported to Duluth, unloaded from the trains, and loaded into large lake steamers with a minimum of human effort

Lake shipment Nearly all of this ore moves to the southern borders of the Great Lakes, where it is used to supply the great iron and steel mills that are distributed from Chicago to Buffalo on the lake shores, and south to Pittsburgh, Youngstown, Middletown, and other manufacturing centers of the interior. The lake steamers which carry the ore are especially constructed for this purpose, and the costs of transportation are among the lowest in the world. When the ships arrive at the receiving ports they are unloaded by cleverly devised machinery which scoops the ore out of the ships quickly and easily. At the same time the ore is loaded into cars to be transported to the blast furnaces.

DISTRIBUTION OF IRON AND STEEL CENTERS

Relation to coal and to markets. Iron ore usually goes to coal, but it always goes to a market. It is a well-known fact that iron and steel industries use more tons of coke than of iron ore. It requires coke to smelt iron ore and later to make it into steel, and again into steel products. Consequently, in extracting the iron from the ore, and in manufacturing it into razor blades, automobiles, locomotives, and various other steel products, the total amount of coke consumed greatly exceeds the amount of ore utilized. This need for large quantities of fuel makes it cheaper to transport the ore to the coal fields than to move the coke to the iron ore deposits. However, it is more important that the steel mills be located close to market than it is for them to be situated close to either the coal fields or the ore deposits. Proximity to markets rather than to raw materials is the most important factor in determining the location of steel mills. In most cases, however, the great industrial centers—the major iron and steel markets of the world—are situated on or near coal fields in order that they may have a cheap supply of fuel. As a result, iron ore usually moves to those particular coal fields suitably located for industrial development. That is, iron ore usually moves close to both coal and markets at the same time. It must be borne in mind, however, that steel industries will develop wherever markets are

especially favorable, even though both coal and iron ore have to be imported from remote regions.

The Great Lakes and Pittsburgh iron and steel centers. The southern shores of the Great Lakes represent a favorable location for the marketing of steel products. Consequently, in spite of the fact that these areas contain neither coal nor iron ore, the industry has developed there with remarkable rapidity. The region is now the center of the greatest blast furnaces and steel industries of the United States (Illus., p. 246). The iron ore for use in the mills comes from the Lake Superior District to the northwest, whereas the coking coal is shipped in from the bituminous fields of western Pennsylvania, eastern Ohio, and central and southern Illinois.

The disadvantages of shipping both coal and iron to the southern shores of Lake Michigan and Lake Erie are more than offset by the ease of distributing the manufactured products from these lake centers. The states bordering Lake Erie and Lake Michigan contain more than 45,000,000 people, and the neighboring portions of Canada contain approximately 6,000,000 people. Thus more than 35 per cent of the combined population of the United States and Canada can be supplied very easily with iron and steel products from these lake-shore mills. Pittsburgh is also centrally located in the industrial heart of eastern North America and has an excellent location for the distribution of iron and steel products. In addition, the Pittsburgh District is located near the finest coking-coal field of the entire United States.

Birmingham district. The area surrounding Birmingham, Alabama, is the only place in the world where large supplies of coking coal, iron ore, and limestone are all found within the same vicinity. These factors have favored the manufacture of pig iron, much of which is shipped to the steel mills of northeastern United States. Since the South has not become highly industrialized, its market for steel products is not large and the steel industries of Birmingham are not highly developed. The recent growth in the industrial development of the South gives rise to the belief that the steel industry of this region may also develop rapidly.

Dependence of our steel industries upon foreign resources. As previously indicated, the United States is blessed with an abundance of the major raw materials (iron ore and coking coal) used in the manufacture of steel. Yet almost every ton of steel produced in this great land contains some mineral which must be imported from a

foreign land. Most of the steel manufactured in this country today is alloyed with chromium, nickel, or some other metal in order to produce a steel alloy that has some peculiar quality not possessed by pure steel. Most of these alloys are imported. For example, between 1926 and 1935 more than 99 per cent of the chromite, 97 per cent of the manganese, 95 per cent of the nickel, and 88 per cent of the tungsten used in our manufacture of steel have been imported from foreign lands.

USES OF IRON AND STEEL

Iron and steel are useful in the manufacture of thousands of products. Yet, normally, more than 50 per cent of all the steel produced within the United States is used by the railroads, the automobile factories, and the building industries. More than one-half of the remainder is used in the manufacture of pipes to carry oil, gas, and water, and of machinery for the farm and factory.

RELATION OF IRON AND STEEL TO CIVILIZATION

? Handly
The nature of the major achievements of peoples has differed strikingly from one time to another and also from one place to another during any given period. The early Greeks, who stressed the importance of literature and art, attained a pre-eminent position in these phases of civilization. The early Romans made great contributions in the fields of government and law. Perhaps the foremost contributions of the Hebrews have been in the field of religion. The Chinese and the Hindus have at times given their best energies to the study of philosophy and religion. These fields of achievement contrast sharply with that phase of civilization known as industrialism. The peoples of certain countries today take greatest pride in their material progress, and spend the best of their energies to promote industrial enterprises.

It may be readily seen that in the promotion of the finer phases of civilization, such as religion, philosophy, literature, music, and art, steel plays but an indirect role. In the development of an industrial civilization, iron and steel play such an important part that the last few decades have sometimes been called the "machine

age" Such a term applies only to the great industrial nations. Certainly the peoples of China, India, and most parts of Africa cannot properly be said to be living in a "machine age" in so far as their own countries are concerned. In the science of government iron and steel would play but a minor role if "right" were the guiding principle. When, however, "might" becomes the god that is followed, government becomes steel-armored. When one nation begins to manufacture armaments on a vast scale, neighboring countries are likely to become alarmed. Soon most of the great nations and many of the weaker ones are engaged in the manufacture of deadly weapons. No one doubts that the number and efficiency of guns, battleships, armored tanks, and bombing planes which a nation possesses, or may possess, influence the political thought of many a nation.

Thus the height to which a civilization may soar along certain lines bears but little relation to the available supply of iron and steel, but the direction in which a civilization moves is likely to be greatly influenced by its supply of these resources. For example, Gandhi, dressed in a loincloth, sat on the ground in North India and taught his followers the art of nonviolent or passive resistance. The minds of these humble people were fertile fields for the sowing of such seed. Most of them, having no weapons except clubs with which to fight, were glad to learn of some other method than war by which men might win their battles. Gandhi, however, would probably have found a less sympathetic audience in a country bristling with cannon, machine guns, and armored tanks, or in a country studded with almost impregnable fortresses, and guarded by powerful battleships, bombing planes, and millions of soldiers, sailors, and aviators, trained in the art of fighting.

The peoples who are accustomed to the industrial civilization of the Western world sometimes write and speak of the backward conditions in other parts of the world. It might be desirable at such times to remember that no one nation has ever excelled in all of the finer qualities of civilization. Certainly the Great Powers, with their steel-shod, steel-armored, and steel-operated civilization, have much to learn concerning the philosophy and purposes of life. What, then, is the value of iron and steel to civilization? These products may be useful in making a living. They are of no value in learning how to live, except as their use may afford leisure for the development of the finer qualities of life.

QUESTIONS AND EXERCISES

- 1 Define (1) iron ore, (2) steel
- 2 Why is iron the most valuable metal?
- 3 What factors determined the location of the iron and steel industries during the early days of their development?
- 4 What were the major discoveries and inventions that have made the large production of iron and steel possible?
- 5 Briefly discuss the major contributions to civilization that were made by each of the processes of steel manufacture
- 6 What countries produce most of the world's steel? Why?
7. Write a 500-word composition on one of the following subjects
 - (a) How an Abundance of Iron and Steel Makes for Industrial Supremacy.
 - (b) How an Abundance of Iron and Steel Makes for Commercial Supremacy
 - (c) How an Abundance of Iron and Steel Makes for Military and Naval Supremacy
8. How have iron and steel contributed to the supremacy of the countries bordering the North Atlantic Ocean?
9. What are the major advantages of Pittsburgh and the Lower Lakes District for the production of steel?
10. How have the iron and steel industries influenced the trends of civilization?
- 11 To what extent was the progress of the Industrial Revolution dependent upon developments of iron and steel industries?

FURTHER READINGS

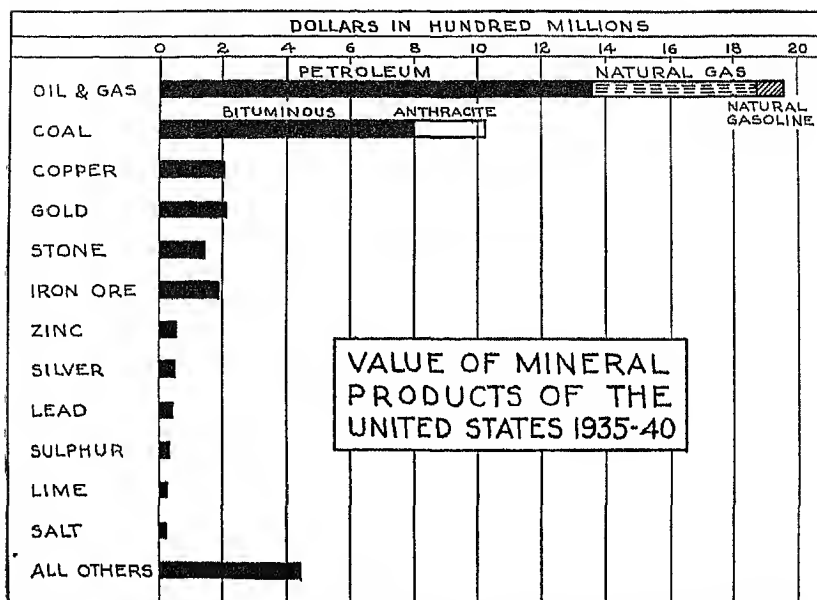
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MINERAL FUELS AND WATER POWER

Few factors of the natural environment have had greater influence in shaping the destinies of man than have mineral fuels and water power. These resources do not, of course, rank first among the necessities of life. Life itself could not exist without the proper climates and the necessary soil and water resources to support it. For thousands of years plants and animals supplied man with practically all of the necessities and many of the luxuries of life. These resources, however, are insufficient to permit man to achieve industrial greatness. It was not until he learned to use minerals that the foundations were laid for a rich industrial evolution.

Without minerals no nation can hope for a sustained industrial and commercial advance. The extensive use of minerals is the element which most clearly differentiates the peoples of the great industrial world from the masses of Asia and Africa. It is the use of minerals that most clearly differentiates our complex civilization of today from the simple one of a thousand years ago. Although scores of minerals are needed in our complex industrial evolution, mineral fuels are the ones most valued by all nations.

Human energy and mechanical energy. The first requirement for the progress of civilization is human energy. No matter how great the resources of a country, the people cannot advance unless they are physically and mentally active. As indicated in Chapter 2, the degree of human energy is closely related to climatic conditions. However, human energy is not sufficient in itself for the development of a great industrial civilization. For such purposes, vast quantities of mechanical power are also needed. Just as the degree of human energy is closely related to climate, so the amount of mechanical energy that can be cheaply and easily developed is closely related to coal fields, oil and gas pools, and water power. Those countries which have an abundance of both human and mechanical energy are highly favored in the race for industrial supremacy. Fortunately the United States holds such a favored position. Our climates are relatively invigorating and our people are active. We possess almost



Mineral fuels represent approximately two-thirds of the total value of all minerals produced within the United States annually

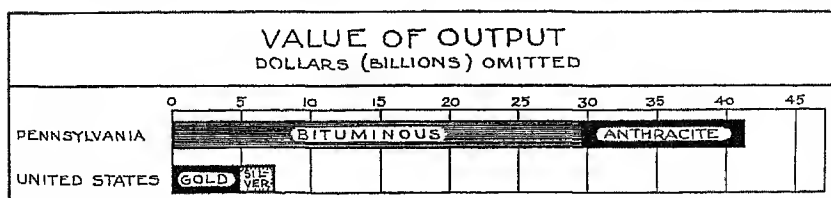
one-half of the world's coal, large supplies of oil and natural gas, and have great potential water-power resources

COAL

Importance of coal. Coal is not only the most important of the mineral fuels, but it is also the most important of all minerals. The value of the annual coal production of the world is about one-half that of all other minerals combined. Within the United States, however, the annual value of the coal output is surpassed by that of petroleum.

The importance of the coal industry is seldom fully understood. During the history of our country, the value of the coal output of one state, Pennsylvania, has been approximately six times that of all of the gold and silver that has ever been produced within the entire country.

The great importance of coal is a result of its wide variety of uses. It is the major source of heat for the American homes; it is the principal source of power for the railroads and manufacturing industries; and it is used in large quantities in the manufacture of

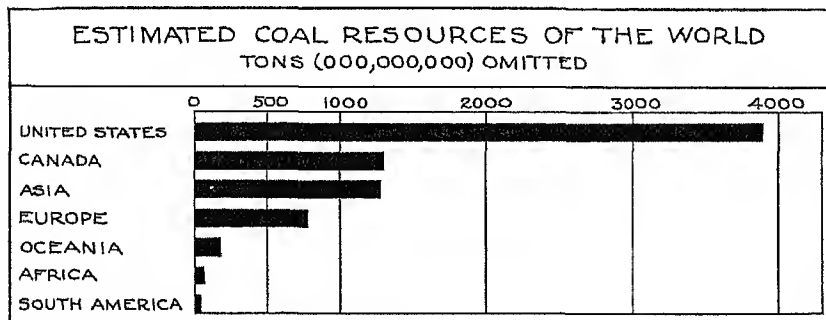


Value of the gold and silver production of the entire United States up to 1937 compared with value of the coal mined in Pennsylvania alone

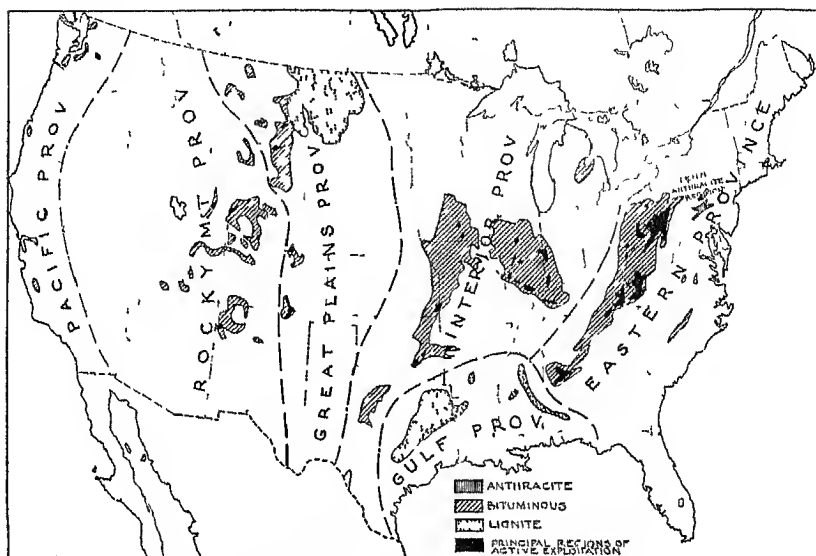
iron and steel products. In addition, scores of by-products are obtained from coal in the manufacture of coke. The most valuable of these are dyes and gas.

Supply and distribution of coal. No other country in the world is so abundantly blessed with coal as is the United States. (Chart below.) According to the latest estimates, our great and powerful Republic possesses more than 100 times as much coal as is contained in all of the countries of South America combined. Even Europe, with its several great industrial nations, possesses less than one-fourth the coal reserves of the United States.

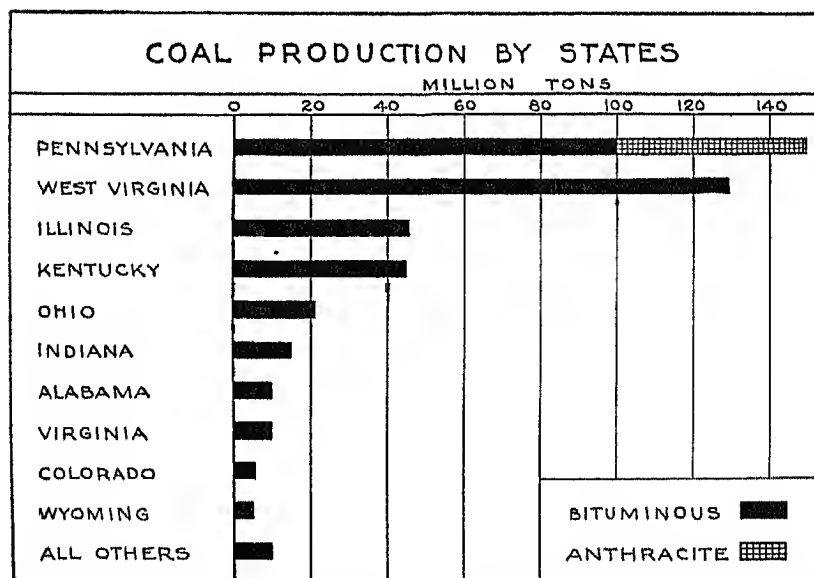
The reserves of the world are large enough to last for thousands of years at the present rate of consumption. It should be observed, however, that approximately 70 per cent of all of this coal is found in North America, whereas less than one-half of 1 per cent is found in South America. Even within the United States, the coal resources are exceedingly unevenly distributed. (Illus., p. 258.) There is relatively little coal west of the Rocky Mountains, while most of that found within the Great Plains is of low grade.



The United States possesses almost one-half of the known coal resources of the world.



Coal resources of the United States

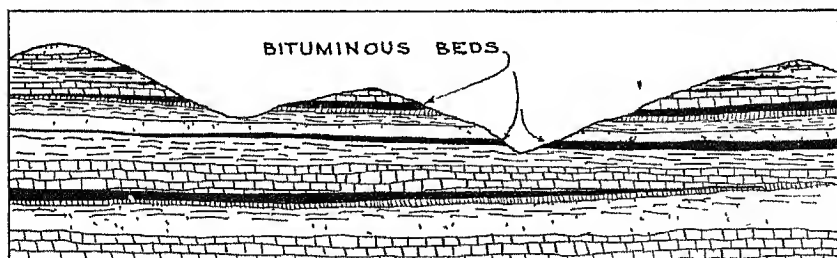
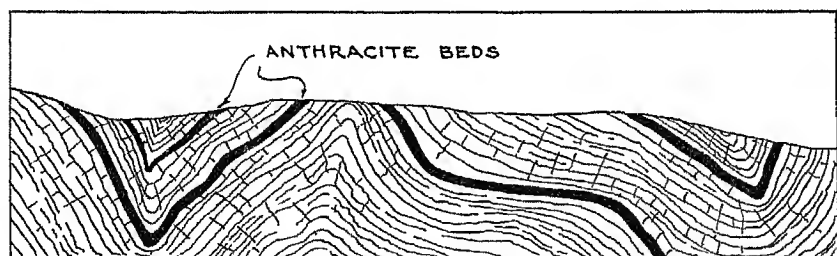


The Appalachian coal field represents the most valuable mineral deposit in the world. More than one-half of the coal mined in the United States is produced in Pennsylvania and West Virginia. Data for 1935-40.

Kinds of coal. From the commercial point of view coal is usually divided into three different kinds—*lignite*, *bituminous*, and *anthracite*. There are different grades of each of these kinds, but space will not permit an extended treatment of them here.

Lignite is the poorest kind of coal. It has a brown color, contains large quantities of moisture, crumbles badly when exposed to the air, and heats quickly when piled in large quantities. When piled up in a coalbin it sometimes catches fire from its own heat. This process is called spontaneous combustion. Moreover, lignite has a low heat value. As a result of the foregoing qualities, but little lignite is mined unless other fuels are expensive. In parts of the Great Plains, remote from good fields of bituminous coal, some lignite is being mined.

Bituminous coal is the type most widely distributed and most extensively mined. It is superior in all respects to lignite, but inferior in some respects to anthracite. It is a soft coal, is relatively dirty, and unless burned under scientific conditions, it creates a great deal of smoke. The better grades of bituminous coal are used in the manufacture of coke, which, in turn, is a relatively clean fuel. Large quantities of coke are also used in the manufacture of iron and steel products.



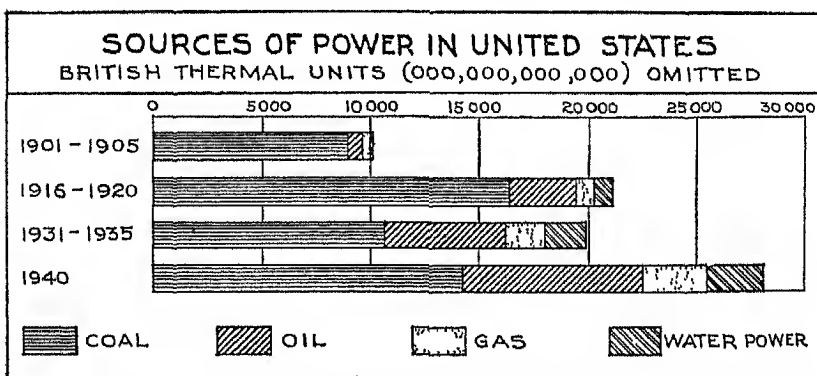
Coal is much more easily mined in the bituminous fields as portrayed here than in the anthracite fields. Why?

Anthracite is an exceedingly hard, dense coal which contains relatively little moisture. It has a jet-black, lustrous color, and when broken, its surface appears almost as though it had been polished. It is clean to handle, burns with a short blue flame with practically no smoke; and can be regulated to give much or little heat as conditions may require. These qualities make it an excellent fuel for heating homes, especially where stoves are used. Unfortunately, many of the beds of anthracite coal are steeply inclined, making mining more difficult and expensive than in the better bituminous coal fields, where most of the beds are nearly horizontal.

Uses of coal. Practically all of the coal produced within the United States is consumed in the following ways: as railway fuel; as a source of power for manufacturing, as a raw material in manufacture, as fuel for homes; or as fuel for ships. Even when exported, it is used in a foreign country in one of the ways mentioned above.

The railroads are our largest consumers of coal. It requires a tremendous amount of power to pull long freight and passenger trains over our 250,000 miles of railway. Twenty-five to fifty million loaded freight cars are handled by our railroads each year. The exact number depends upon the degree of prosperity enjoyed by our country. It is not surprising, then, that approximately one-fourth of our national coal output should be consumed in railroad locomotives.

The thousands of smokestacks of our great industrial centers attest the importance of the use of coal in manufacturing. Coal is



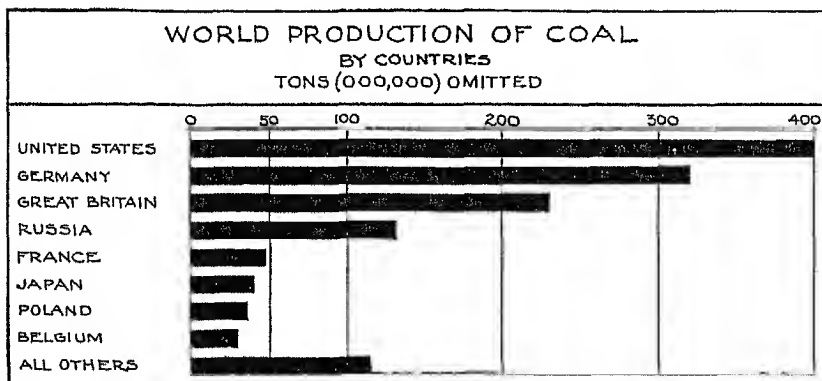
Coal is still the major source of power in the United States. During the last few years, however, the consumption of oil, gas, and water power has been increasing more rapidly than that of coal.

still the most important source of heat and power of the United States (illus opposite) Most of the large-scale and complicated machinery which increases human output so enormously is driven by power made from coal At the same time, most of the heat needed for the production of steel, cement, bricks, and thousands of other manufactured products is derived from coal Finally, millions of homes and apartments are heated each winter by coal

Coal enters industry, not only as a source of heat and power, but also as a raw material In 1935, more than 50,000,000 tons of coal were used in the manufacture of coke This coke is used primarily in the manufacture of pig iron and in the heating of homes A large part of the gas used for cooking is made from coal Coke and gas are the two most important manufactured products derived from coal Yet, as pointed out previously, there are scores of other important products, such as chemical dyes, explosives, antiseptics, and fertilizers made from this valuable mineral

Distribution of coal production. When one considers the various uses of coal it is recognized that the great industrial nations are the ones that need the largest quantities of this fuel Unfortunately, some of the industrial nations possess but little coal and are compelled to import fuels. Such nations are greatly handicapped in the race for industrial supremacy

We have already learned that the coal resources of the world are unevenly distributed among nations The coal production of the world is even more unevenly distributed In fact, normally, three



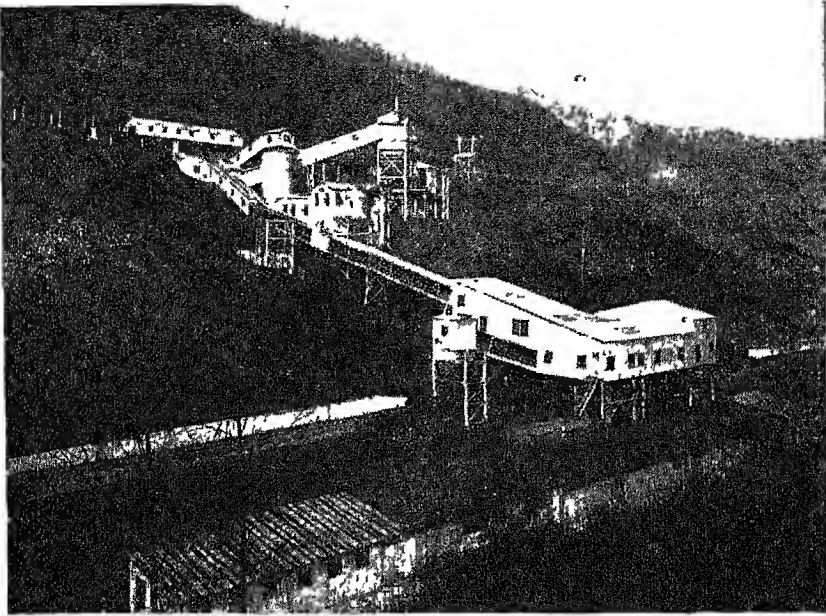
Normally, three countries (the United States, Germany, and Great Britain) produce more than twice as much coal as is produced by all other countries combined. Data for 1935-39.

countries—the United States, Germany, and Great Britain—produce more than two-thirds of all the coal mined each year. This fact helps to explain the strong position of these three countries among the nations of the world.

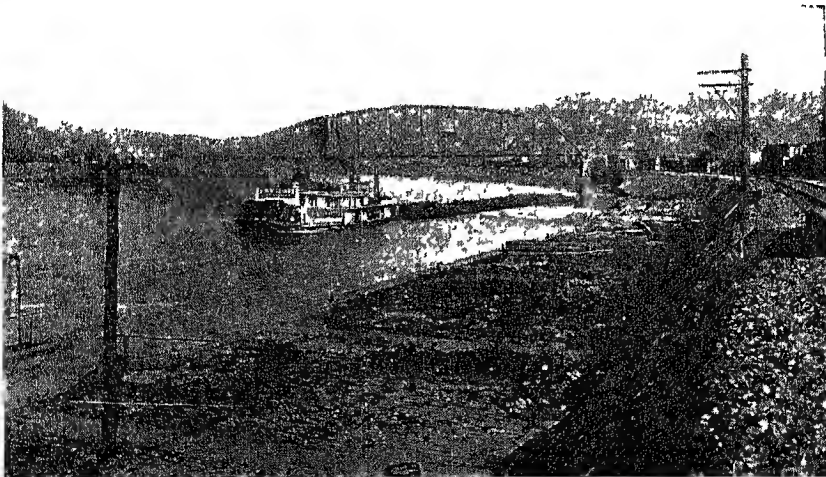
There are many fine coal fields in the world where production is negligible. For example, China possesses large quantities of high-grade coal, much of which is easily mined. Siberia and Australia have large resources, but mine relatively small amounts each year. The lack of production is due to many factors: political instability in certain areas as in China and Manchuria; distance from centers of large consumption, as in Siberia, Australia, and Utah, the poor quality of the coal, as in Texas, and Alberta, and the backwardness of the peoples, as in large parts of Africa and Asia. Consequently, the uneven distribution of coal production is related to both social and natural causes. A country's output may be small because its resources are limited, or it may be small because of adverse social conditions.

The Appalachian coal fields. The Appalachian Highland area is the most important coal-producing region in the world. It is responsible for approximately 80 per cent of the output of the entire United States. Many factors favor large production in this region. It contains high-grade coal for almost every purpose. The anthracite and Pocahontas coal fields supply some of the highest grades of domestic fuel to be had anywhere. The Connelsville District of Pennsylvania is famous for its excellent grade of coking coal. The Pittsburgh seam of coal is one of the finest in the world for the manufacture of gas. Most of the coal of this region is well-suited for use in factories and locomotives.

Not only is the coal of high grade, but it is also easily mined. Many of the finest coal seams outcrop on hillsides, so that tunnels may easily be driven into the coal seam without sinking shafts. Compare the illustrations on page 259 and at the top of page 263. The first is a diagram showing the coal outcrop, whereas the latter is a picture showing how the coal is brought by gravity down to the railroad, where it is loaded into cars. Many of the coal seams are thick and almost horizontal, making it easy to use labor-saving machinery in mining. As a result of this ease of mining and the large-scale use of machinery, the daily per capita production of coal in the United States is greater than that for any other country in the world. For example, the miner in the bituminous coal fields of this



Coal being mined from an outcrop on the side of the mountain. The coal is conveyed by gravity to the railroad cars below. The opening of this coal mine was a simple task compared to that of opening a mine in a region where the coal lies hundreds or even thousands of feet beneath the surface of the earth (Courtesy U. S. Bureau of Mines)



Many thousand tons of coal are guided down the Ohio River by a single tugboat. This coal can be transported from Pittsburgh to Cincinnati or even to New Orleans for a few cents a ton (Courtesy U. S. Bureau of Mines)

country produces, on the average, from five to six tons of coal per day, whereas the Japanese miner produces only one ton per day. This large output per laborer makes for low-cost production and results in low-priced coal for the American consumer.

The high grades of coal and the ease of mining are not the only factors that favor large production in the Appalachian Highlands. This region is centrally located for the most densely populated part of North America. It is supplied with excellent transportation facilities by water, railroad, and highway (Illus., p. 263). It is in the heart of a great manufacturing center which needs coal for power, fuel, and industrial uses. Then, too, eastern United States is rich in iron ore, cement materials, clay suitable for the manufacture of bricks and pottery, and other raw materials which require large quantities of coal for their manufacture. All of these factors combine to make the Appalachian Highlands the greatest coal-producing area in the world.

Other coal-producing areas of the United States. The coal fields of the interior province are second in importance to those of the Appalachian Province, Illinois, Indiana, and western Kentucky all produce large quantities of coal. In most parts of this area mining is more difficult and expensive than it is in the Appalachian Region. Many of the coal seams of Illinois and Indiana do not outcrop on the hillsides, but lie deep beneath the surface of the earth. It becomes necessary under such conditions to sink shafts at great expense before mining operations can be undertaken.

There are places in Kansas where the coal lies close to the surface and can be mined by the open-cut method. That is, the mantle of earth that covers the coal is first removed; then the coal may be mined by use of the steam shovel.

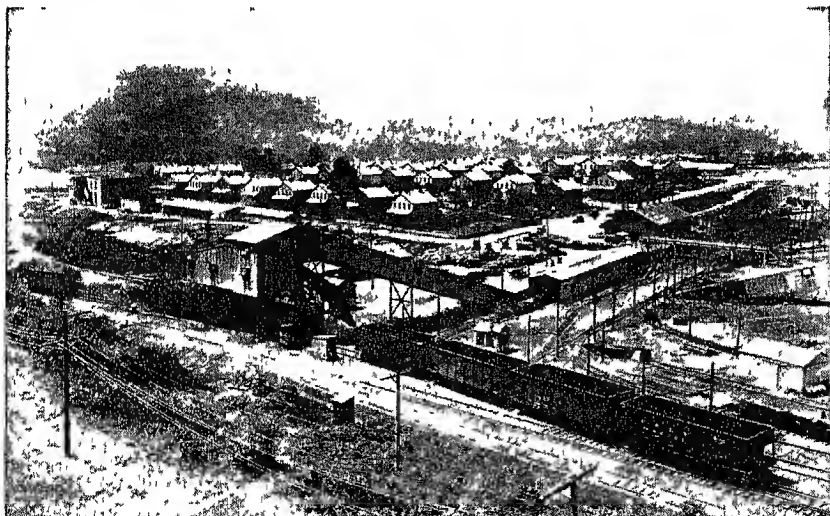
The Rocky Mountain Province possesses large quantities of high-grade coal, much of which is easily and cheaply mined. However, the demand for coal within this area is not large, because the region is sparsely populated, the railroad mileage is small and the demand for locomotive fuel is light; and the industrial development is greatly restricted.

The Pacific Province is poverty-stricken with regard to coal. This area possesses no high-grade coal and very little coal of any kind. The need for coal along the west coast has been reduced because of two other resources—petroleum and water power. California possesses some of the finest oil fields in the world, and all of the

western states have vast water-power resources that may be easily and cheaply developed.

Social conditions in coal-mining regions. As in all other industries, so in coal mining, social conditions vary greatly from one mining center to another. Yet there are hundreds of mining towns that have many characteristics which are common to all. While it is impossible to give social conditions typical of all mining towns, one can point to such conditions typical of hundreds of mining communities.

Many of the mining towns are situated within narrow valleys in order that the laborers may live close to the mines that are opened on the slopes of the adjoining highland. In many instances the miners' homes are perched on the side of steep hills. Many of the houses are mere shacks, and frequently whole rows of them are identical. Usually they are cheaply constructed, unpainted, and poorly kept. Relatively few miners take a real interest in the upkeep of their houses and yards, because they have little assurance that they will live in them for any long period of time. Yards, gardens, streets, sidewalks, and other surroundings are very often neglected. Such an atmosphere scarcely encourages cleanliness. Lack of adequate sanitation facilities is likely to result in an undue amount of sickness.



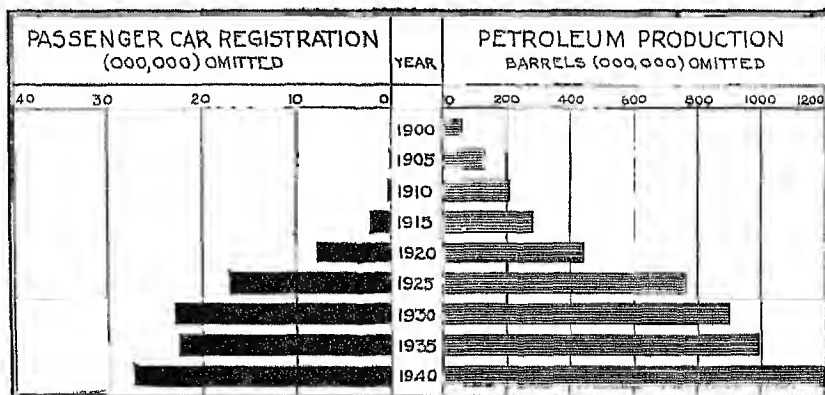
A coal-mining town. Note the rows of houses, all built alike. (Courtesy U. S. Bureau of Mines.)

These conditions are the result of many factors. Foremost among these may be noted the fact that many of the mining towns are highly isolated, a condition that lends itself to backwardness; and that many of the miners are foreigners who do not have American standards of cleanliness, sanitation, and love for home surroundings.

THE PETROLEUM INDUSTRIES

Spectacular development. The petroleum industry is in some respects the most interesting of all of the mineral industries. The development has all occurred within the last 75 years. In fact, as much petroleum was produced during the 11 years, 1927-1937, as was produced in all preceding history of the world. Although petroleum was discovered within the United States in 1858, almost 95 per cent of the total output has occurred since 1900. Few other industries have had such a spectacular development in such a short period of time.

Uses of petroleum. If for any reason the United States were suddenly deprived of its petroleum products, industry would be paralyzed within a few hours. Approximately 29,000,000 passenger cars would become useless, millions of truck drivers would be thrown out of work, and farm tractors all over the country would be left stranded in the fields. These conditions, however, would represent but the beginnings of our troubles. Industrial machinery all over the United States would become idle because of a lack of lubricants,

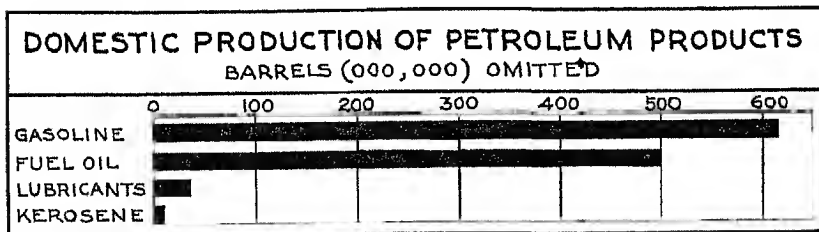


The petroleum and automobile industries are dependent upon each other for their development. Approximately 29,000,000 passenger cars were being operated in the United States when gas rationing started in 1942.

petroleum-burning merchant ships, battleships, and railroad locomotives would be stranded for lack of power and lubricants, millions of men would be thrown out of work, and panic would grip our land from coast to coast. Other industrial nations would be injured almost as much as we. Fortunately no such calamity threatens, but there is need to conserve such a valuable resource.

Lubricants. The most widely used products of petroleum are lubricants. Perhaps 99 per cent of the machinery of the world is lubricated by petroleum products. Speed machinery, such as dynamos, motors, automobile and airplane engines, must be lubricated with high-grade oils. Wheels of freight cars which move at comparatively slow speed, but which sustain great weight, need heavy grease. Refrigerator machinery may need oils that will not freeze easily, whereas certain high-speed machinery may need oil that does not easily catch fire. Petroleum is the only product from which all these types of lubricants can be made cheaply.

Gasoline and its importance in transportation. The most bulky product of petroleum is gasoline. The rapid development of our automobile industry, with the resultant demand for gasoline, has been largely responsible for the tremendous increase in the production of petroleum. Indeed, the two industries are dependent upon each other for their present stages of prosperity. (Chart opposite.) The petroleum industry developed somewhat before the automobile was invented and before there was any demand for gasoline. As a result, during the early days of the petroleum industry, gasoline was a waste product that was a constant bother to the manufacturers of kerosene. Today the production of gasoline within the United States is nearly 10 times that of kerosene.



Formerly kerosene was the major product of petroleum. Today, the bulk of our petroleum output is consumed in the form of gasoline or as fuel for industrial plants, ships, and homes. Kerosene and lubricants are, however, exceedingly valuable products. Data for 1941.

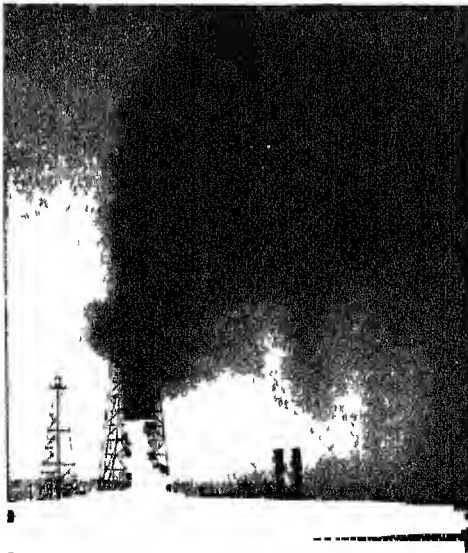
Fuel oil. Petroleum is one of the finest fuels ever produced by nature. It is surpassed in this respect only by natural gas. Petroleum is more compact than coal, it can be fed into the furnace with more precision than coal, it burns with more precision than coal, and it burns with less waste than other commonly used fuels, with the exception of gas.

During the last few years the use of fuel oil has increased rapidly. Scores of railroad locomotives now burn oil, almost one third of the world's merchant ships are fueled with petroleum, thousands of homes are heated with oil, and many industrial concerns find that petroleum best serves their needs for fuel and power.

Kerosene. Kerosene, once the most important product of petroleum, is still widely used. The coal oil lamp is still used to light more than one-half of the homes of the world. Within the industrial sections of the United States and western Europe millions of boys and girls have never seen kerosene lamps, but in large sections of

the densely populated countries of Asia, kerosene lamps supply practically the only lighting system of the home. Even within the United States and in large sections of Europe, kerosene still supplies most of the light for rural homes. It is also the fuel for most farm tractors and the principal summer fuel for millions of farm homes.

How petroleum is obtained. Petroleum is found stored in porous sandstone or limestone at depths of 100 to 10,000 or more feet. These oil-bearing rocks lie below other rock formations, known as *cap rock*, through which oil cannot pass. Sometimes the gas



An oil gusher spraying thousands of barrels of unsightly and highly inflammable oil over the landscape. The world's annual output of "black gold" is much more valuable than the annual output of metallic gold. (Courtesy *The Oil and Gas Journal*.)

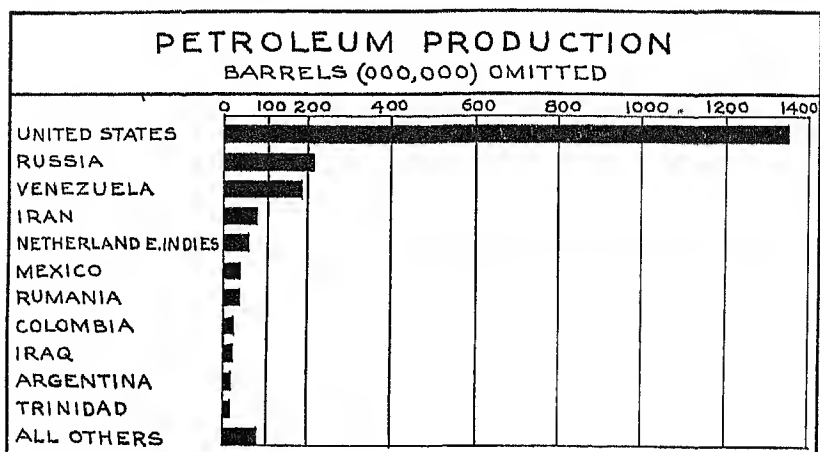
pressure against the cap rock is tremendous. Consequently, when holes are dug through the cap rock the oil rises towards the surface, and sometimes even gushes forth with great force.

Some of the wells dug in Texas and Mexico have spouted forth oil in six- or eight-inch columns to heights of 200 feet, and have produced 75,000 to 100,000 barrels, or even more, per day. Sometimes the force is sufficient to blow the heavy drill tools out of the well. Such wells are difficult to control and may blow wild for days or weeks with a loss of large quantities of petroleum. Since petroleum is normally worth from \$0.90 to \$3.00 a barrel, one can readily imagine the excitement that follows the discovery of such wells as mentioned above. The product is sometimes called "black gold." It is certainly more useful than gold, and the annual value of our petroleum output is several times that of our gold production.

Causes of overproduction of petroleum. Petroleum will flow from one farm to another, or from the property of one oil company to that of another. Consequently, when a rich pool of oil is discovered, each farmer wishes as many wells dug on his land as possible, in order that his neighbors will not secure more than their share of the oil. Similarly, each oil company wishes to secure its full share of petroleum. As a result there may be a race among the rival companies to see which one can take out the oil most rapidly. This method of exploitation may result in five times as many wells being dug as are necessary for the most economical development of the field. When such a race occurs in several fine pools at the same time, the output may greatly exceed the needs of the country. This overproduction may drive the price of crude oil to ruinously low levels, with disastrous results for the weaker companies.

Areas of production. The world's supply of petroleum comes chiefly from four areas. The United States leads all other regions and produces almost two-thirds of the total output. The region second in rank is located in eastern Europe and in neighboring parts of western Asia. The important producing areas of this region are Soviet Russia, Iran (Persia), and Iraq. Middle America ranks third, with Venezuela, Colombia, and Mexico as the major producers. The only other producing fields of importance are situated in the East Indies.

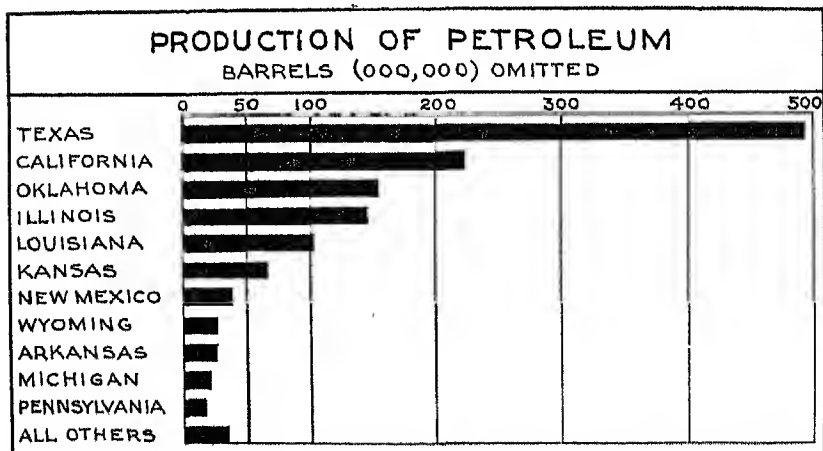
Oil fields of the United States. The known deposits of petroleum are widely scattered, but approximately 90 per cent of the output is derived from three fields designated as the California, the Mid-



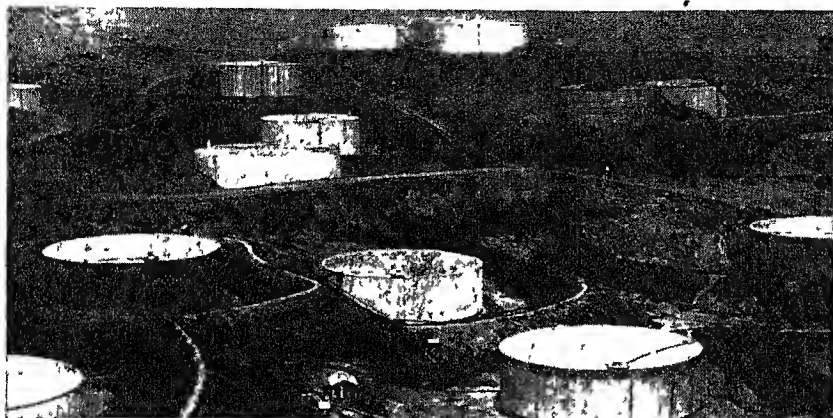
Data for 1942 for the United States and for 1941 for other countries.

Continent, and the Gulf Coast. In fact, three-fourths of the output is derived from the three states of Texas, California, and Oklahoma.

Utilization of petroleum. When a well is brought in, the petroleum is first piped to large tanks where it is stored until needed. (Illus., p. 271.) Later it is transported by pipe line, or in tank cars, tank ships, or trucks, to the refineries. Pipe lines connect all of the fields east of the Rocky Mountains with the principal refining centers. California, being somewhat isolated, has developed a pipe-line system of its own. In 1941 almost 1,300,000,000 barrels of petroleum



Most of our petroleum is produced in sparsely populated areas. Data for 1941.



Petroleum is stored in these great tanks until it is needed. Note the dikes thrown around each tank. These dikes are built to prevent fire which may break out in one tank from spreading to another. (Courtesy American Petroleum Institute)

were handled by pipe-line systems which extended more than 100,000 miles. Some of the petroleum was carried from the Texas fields almost 2,000 miles before it arrived at the refineries located on the Atlantic Seaboard.

Need for conservation. Scores of geologists have attempted to estimate the American reserves of petroleum, but with little success. New pools are being discovered from time to time, which upset former calculations of resources. However, the reserves of the present producing areas are estimated at about 13,000,000,000 barrels. This is enough to last the United States approximately thirteen years. Undoubtedly other pools will be found. Yet the most liberal estimates indicate that there is grave danger of our resources being greatly depleted within a few decades. Since petroleum is of such great value to modern industrial nations, our limited supply should be conserved as much as is consistent with the greatest welfare of our people. Even if it should last a hundred years, that is but a short period in the history of our nation.

At the present time we know of two substitutes for petroleum. All of the products of petroleum can be obtained both from oil shale and from coal. These substitute products are at present costly. Alcohol, distilled from wood or other vegetable matter, may be substituted for gasoline, but at present we know of no way to obtain a cheap and suitable supply of lubricants except from petroleum.

NATURAL GAS

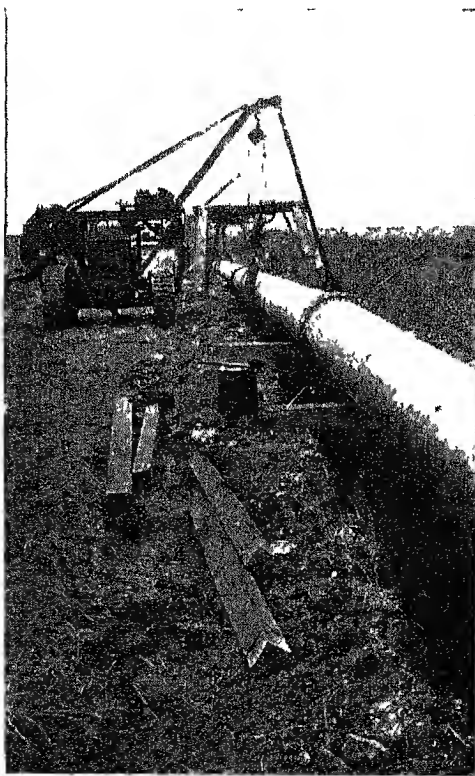
The United States as the only important consumer. Natural gas is the finest fuel ever produced by nature. Although it has been discovered in many parts of the world, its use is confined very largely to the United States. The reason for this situation is easy to understand. The only economic method of transporting natural gas is by means of pipe lines. The United States is the only place where large gas fields and great industrial centers are situated close together. The American industrialists, therefore, have an advantage over all other peoples in the use of this valuable fuel.

The early development of the natural gas industry occurred in eastern United States where gas fields and industrial centers were

close together and could be served by short pipe lines. As utility companies grew powerful and gained experience in the transportation and utilization of this valuable fuel, they built longer and longer gas mains. Today, pipe lines transport gas from the fields of Texas, Oklahoma, and Kansas to Chicago, St. Paul, and Terre Haute. From the latter city gas can be turned into gas mains which extend to cities situated on the Atlantic Coast.

Waste of natural gas.

During recent years we have wasted almost as much natural gas as we have consumed. Much of this waste has been intentional. In many of the finest oil pools of western United States, gas lies on



A twenty-two-inch gas main being laid from Texas to Chicago. (Courtesy *The Oil and Gas Journal*)

top of the oil. Under such conditions the gas is frequently blown off intentionally in order to secure the oil. The national and state governments are now beginning to regulate the production of natural gas in order to prevent the unnecessary waste of this valuable product. Such regulation of the wastage of gas reduces the oil output for a time in some of the most productive oil pools.

WATER POWER

Water power and natural environment. The amount of water power that may be developed within a given area depends upon the following factors: (1) the amount of water that is carried by the streams; (2) the regularity of the flow of this water; (3) the steepness of the gradient of the stream bed; and (4) the number and size of the waterfalls or the effectiveness with which dams can be built.

The regularity of flow is just as important as the amount of water. Some regions have precipitation the year round. Other areas have rain for only a few months during the year. For example, India is a land of heavy summer rainfall and winter drought. During the summers the streams are in flood and much power could be developed. During the winter many of the streams are dry and consequently are useless for power development except as water is stored for this purpose. Study the summer and winter rainfall maps of the world to determine the areas of rainfall throughout the year.

Other factors beside the seasonal distribution of rainfall influence the regularity of stream flow. A land barren of vegetation permits the rainfall to reach the streams quickly. On the other hand, in a region of heavy vegetation, the run-off is gradual. Similarly, lakes help to regulate the rate at which water flows. Thus the Niagara River, which acts as an outlet for four of the Great Lakes, has an exceedingly regular flow. In contrast, the Ohio River, which receives its water directly from the hill slopes, is subject both to disastrous floods which are exceedingly destructive to property, and to exceptionally low waters. It is for this reason that the United States Government has built dams in the Ohio River and is building storage pools—lakes and ponds—within the Ohio Valley.

Uses of water power. Falling water was one of the first sources of mechanical power used by man. It is only recently, however, that scientists have learned how to harness this power efficiently.

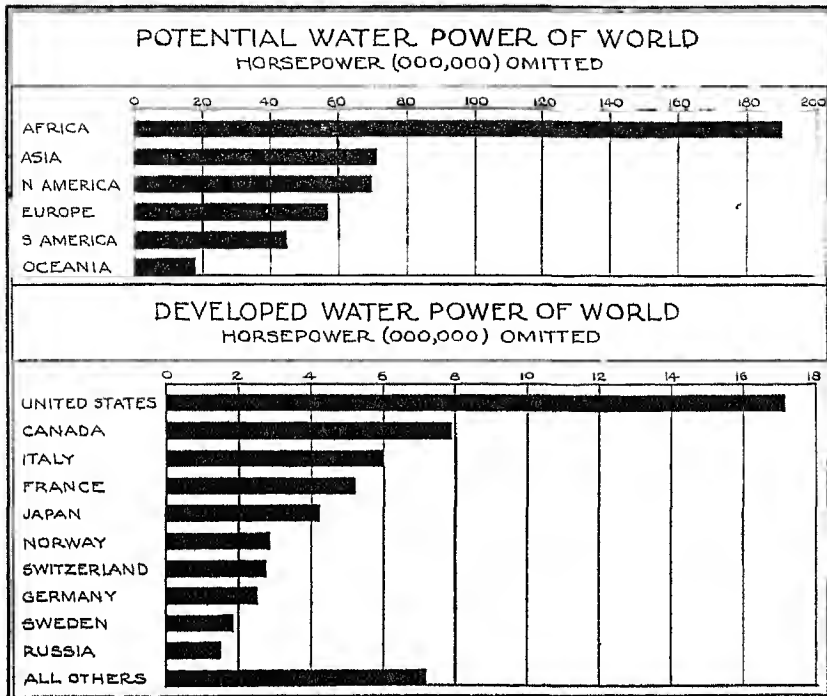
and to transmit it to distant points economically. The old water wheel was inefficient at best. It could utilize but little of the falling water, it was of little value when the streams were filled with ice, and it was necessary to use the power at the site of development.

During the last few decades several factors have worked together to cause a rapid increase in the utilization of water power. The invention of the turbine permits more complete and economic development of power than was possible with the old water wheel. The discovery of cement and of ferroconcrete (iron-reinforced concrete) has permitted the easy and cheap construction of dams for the creation of waterfalls and for the regulation of the flow of water. Finally, the ability to transmit power in the form of electricity to remote places for consumption has greatly increased the demand for such power.

Developed power and potential power. A comparison of the distribution of developed power with that of potential power indicates that present utilization of this form of energy is more closely related to the cultural environment than to the natural one (Chart opposite). Western Europe and eastern North America, with their advanced stages of economic progress, are the important areas of present water-power development. Central Africa, on the other hand, has the greatest water-power resource to be found anywhere.

The importance of the cultural environment with respect to water-power development may be illustrated by the Niagara Falls District and the lower Congo Basin. The former area is frequently referred to as the world's finest power site. The energy of this magnificent falls is estimated at 6,000,000 horsepower. This power is easily developed and is situated close to great industrial centers where it is needed. Both the physical and cultural setting for power development are almost ideal.

The potential power of Niagara Falls is, however, almost negligible as compared with that of the Lower Congo. This mighty river with its rapids and falls has a relatively uniform flow and could be easily and cheaply harnessed. With its tributaries, it is capable of producing 100,000,000 horsepower through the year. There is, however, but little demand for hydroelectric power within the Congo Basin. This hot, wet, forested region, occupied by debilitated (tired, feeble) and uneducated natives, is still largely a great economic waste, with but few industrial plants that need mechanical power. The natural setting is perhaps the finest in the world for the large-scale develop-



The world has an abundant potential water-power supply. Unfortunately, the greatest resources are situated in areas where they are of little or no value. The developed water power has taken place in the industrial areas of the world.

ment of hydroelectric power, but culturally the region is one of the most backward portions of the earth. It is this difference in economic setting that make Niagara Falls a better site than the Lower Congo for the development of power.

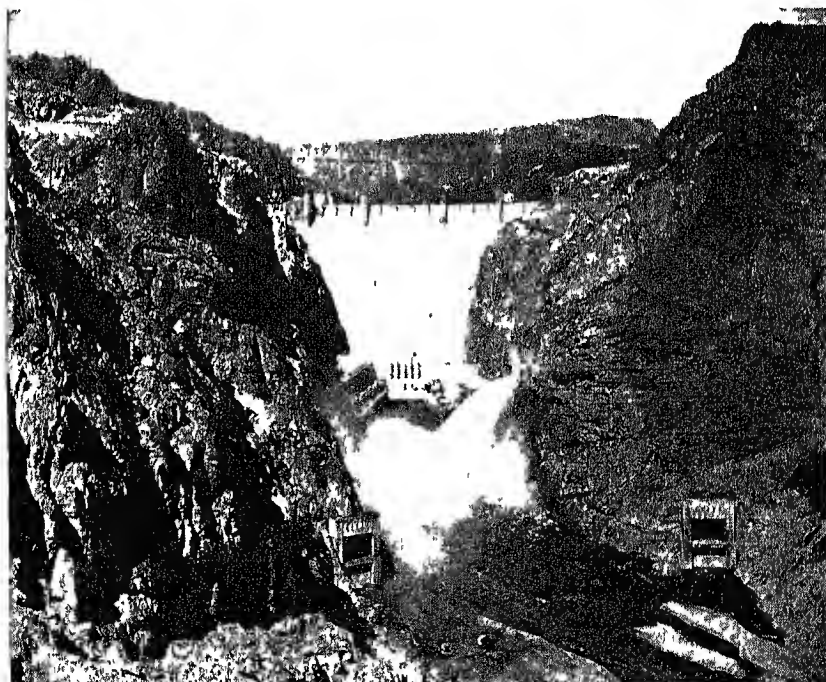
What a fine thing it would be if the great industrial nations of the earth could import power from Central Africa as they do cocoa, palm nuts, and palm oil! Unfortunately, hydroelectric power cannot, at present, be economically transmitted more than four or five hundred miles. Consequently, much of the world's water power is doomed to remain unharnessed for many generations. While this great resource is going to waste, many nations are handicapped because of a shortage of cheap and adequate power.

Developed and potential water power of the United States. Many sections of the United States have an abundance of water-power resources. Altogether there are 40,000,000 to 60,000,000 horsepower

available in our rivers, and by the storage of flood waters in reservoirs, this amount could be doubled. Unfortunately, some of our finest power sites are situated in isolated areas; whereas many of our great industrial centers are remote from areas of great waterpower resources.

It has been estimated that we have enough water power to operate every factory and to drive every railroad locomotive in the country. Yet less than 18,000,000 horsepower is now being used.

During the last few years, great strides have been made in the development of hydroelectric power. The United States Government has launched forth on a program designed to prevent floods. The Norris and Boulder dams are the largest of the undertakings along this line. The Boulder Dam is by far the largest in the world. It is 727 feet high and makes a reservoir more than 115 miles long.



Boulder Dam controls the raging flood waters of the Colorado River, stores water for the irrigation of millions of acres of land, and provides power and light for a large area in southwestern United States. (Courtesy U. S. Dept. of Interior.)

It covers an area of 227 square miles and when filled contains enough water to cover the entire state of Ohio more than a foot deep

Although some of the major purposes of these dams are to prevent floods, to aid in navigation, and to supply water for irrigation, they are capable of supplying large quantities of power. Similarly many other dams have been built, partly to store irrigation waters, and partly to prevent floods. They, too, are useful in supplying power

QUESTIONS AND EXERCISES

1. Explain the meaning of the following terms lignite, bituminous coal, anthracite coal, and coke. Use any good encyclopedia to aid in securing answers.
2. What is the relation of coal to great industrial development?
3. What are the major factors that determine the amount of coal produced in any given region?
4. Why is anthracite preferred to bituminous coal for use in homes heated with stoves?
5. What factors help make the northern Appalachian Region the greatest coal-producing area in the world?
6. Why do some industries use Appalachian coal in spite of the fact that they are closer to other coal fields?
7. Why are most of the great industrial centers of the world located on or near coal fields?
8. More anthracite coal was used formerly than at present. Can you suggest any reason for the decline of anthracite consumption? Name some other clean fuels besides anthracite coal.
9. How is coke made? For what is it used?
10. What is the man power of your automobile? One horsepower of energy represents seven man power.
11. What is the man power of a railroad locomotive?
12. Do you believe that the machine age is better than the man-power and horsepower age? Why?
13. Does the large-scale use of mechanical power bring suffering to some people? Explain your answer.
14. What countries of Europe lead in coal production? What ones of Asia?
15. What are the principal products made from petroleum?
16. What are the chief petroleum-producing countries of the world?
17. What are the chief causes of overproduction of petroleum in the United States?
18. Why are the leading powers trying to get control of large reserves of petroleum?

- 19 Why is the United States the only country in the world that uses large quantities of natural gas?
- 20 Write a composition on one of the following subjects
 - (a) Ways in Which Coal Is of Importance to Me
 - (b) Ways in Which Petroleum Is Important to Me.
 - (c) A Visit to a Coal Mine
 - (d) A Visit to an Oil Field.
 - (e) How Coke and Artificial Gas Are Made
- 21 How have the uses of coal and petroleum influenced social activities? (Read Whitbeck, Ray H., and Thomas, Olive J., *The Geographic Factor*, pp 191-233)
22. Are we wasting our coal, petroleum, and natural gas at an alarming rate? (Read Chase, Stuart, *Tragedy of Waste*, pp. 237-255)

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THE FOREIGN COMMERCE OF THE UNITED STATES

FUNDAMENTALS OF WORLD COMMERCE

What does world trade mean to you? If you had lived 100 years ago, world trade would have played only a minor role with regard to your material well-being. At that time people satisfied their wants almost entirely by the consumption of domestic products. In fact, most of the products were produced within a few miles of their home. Foreign imports consisted chiefly of luxuries and did not figure in the life of the masses. Bulky staple commodities played a small part in world commerce. But what was the exception in 1836 is the rule today. At the present time even the bulky staples are brought from remote countries of the world. Think of the clothing that you wear and the food and drink that you consume from day to day. The silk used in the manufacture of stockings, neckties, dresses, and many other items comes from Japan. The coffee which we consume is imported from Brazil; tea is obtained from India, Ceylon, and Japan, whereas bananas are imported in large quantities only from Central America and the West Indies. Rubber is obtained from the latex of rubber trees grown in distant Malaya. These are but a few of the illustrations which might be given to show our dependence on world commerce.

World trade, formerly confined almost entirely to luxuries, and therefore chiefly to the wealthy classes, has thus become important to the masses of people. At the present time, the British laboring classes have at their disposal Danish butter, Australian mutton, Argentine beef, Canadian wheat, and Indian tea. Their cotton clothing is manufactured from raw material imported from the United States, India, Egypt, and the Anglo-Egyptian Sudan.

Reasons for the growth of world trade. Many factors have contributed to the development of world commerce, of which the following are fundamental: (1) improvements in transportation, (2) increasing mechanization; (3) increasing specialization in production of economic goods, and (4) the ever-increasing human wants and desires.

Transportation and world trade. Modern improvement in both land and water transportation is one of the basic causes of the rapid growth of world commerce. The development of refrigeration for freight car, bus, and steamship made possible long distance transportation of many kinds of perishable commodities. Modern transportation has been extended to many places which were formerly inaccessible. Such areas, therefore, can send their surplus goods to foreign countries in exchange for merchandise that is lacking at home. The increase in the size and capacity of carriers is well illustrated in ocean transportation. Instead of the small holds of sailing vessels devoted to the carrying of spices, precious stones, and luxury items, the large ships of today have a capacity of many thousand tons. Their holds are filled chiefly with bulky goods, such as minerals, grain, lumber, pulpwood, fibers, and fruits.

Mechanization and world trade. Increased mechanization (use of machinery) has taken place, not only in transportation, but also in all types of industry. For example, in the extractive industry of agriculture, where mechanical power has displaced human and animal power, a large surplus of goods becomes available for commerce.

Specialization and world trade. The fact that some regions, industries, and even countries specialize in the production of certain kinds of goods greatly increases the total value of world trade. If a country specializes in the production of one or possibly only a few kinds of economic goods, it is dependent upon the rest of the world for the great variety of commodities required by its inhabitants. In order to receive more and better goods from abroad, more must be produced at home. That leads to still further specialization. Such developments, of course, increase world trade and are made possible because of such trade.

Human wants as related to world trade. The growth of world trade has been due also to the increase of human wants. Energetic peoples have ever sought more and better goods. Inventions have brought forth many new kinds of merchandise. With the spread of education people have increased their knowledge of what may be had. It is a noteworthy fact that per capita consumption of economic goods reaches the highest figures in the areas in which modern educational facilities are available to the masses.

Fundamental causes of world commerce. What causes world trade to flow from place to place? The following factors are funda-

mental. (1) differences in climate; (2) differences in relief, (3) differences in soils; (4) differences in plant and animal resources; (5) differences in mineral resources, (6) differences in distance to markets, (7) differences in degree of economic development, and (8) differences in standard of living and education

Differences in climate, relief, and soils Differences in climate cause differences in agricultural production. For example, the commercial world obtains some of its major commodities, such as rubber, cacao, tea, bananas, coconuts, and jute, from regions that have a tropical climate.

Relief affects world commerce in various ways. Whether a region has a rugged or a level land surface is of considerable importance to transportation. Some of the high mountains, such as the Andes and Himalayas act as barriers to transportation and trade. Moreover, a level to gently rolling land surface facilitates movement from place to place and the use of large labor-saving machines, and therefore makes possible the production of surplus goods for the markets of the world. Such conditions are found in the Spring Wheat Belts of North America. In fact, most of the surplus wheat-producing lands of the world are relatively level and they also have dark-colored soil.

Like those of climate, differences in soils affect chiefly the agricultural industry and therefore the commerce in agricultural products. For example, crops such as rye and potatoes are widely grown on sandy soils. The chief areas of commercial potato production in North America and in Europe have sandy and sandy loam soils.

Differences in plant and animal resources World commerce in plants and animals has had a long history. At the present time the chief sources of native fur-bearing animals are the vast northern forested regions, in which the animals develop heavy pelts as a protection against the extremely cold winter weather. Similarly, domesticated animals show an irregular distribution. Beef, mutton, wool, hides, and skins move from the livestock-producing regions to the consuming markets of the world.

Some of the bulkiest commodities of commerce are the products of the world's plant resources. Of such products lumber and pulpwood are noteworthy. These commodities move chiefly from the vast forested regions to the large centers of population and industry. Thus lumber and pulpwood are exported from Scandinavia, Finland, and the Baltic countries to highly industrialized western Europe.

Tropical wood, such as ebony and mahogany, is shipped from the low latitudes to the industrial areas of the temperate zone.

Differences in minerals From very early times minerals have played an important role in commerce. Precious stones and metals flowed along the channels of trade even during the period of ancient history. With the beginning of the modern age, such trade became much more important. During the sixteenth and seventeenth centuries, Spanish exploration and conquest in the New World centered chiefly about the search for precious metals. Although precious minerals, such as gold, silver, and platinum, still constitute important items of world trade, they are greatly surpassed in value by basic minerals required by modern industry. In some of the trades of the world, coal, iron, and petroleum are most important. The precious as well as the essential minerals for modern industry are irregularly distributed (See Chap 4) Minerals, therefore, flow in trade from the mineral-producing to the mineral-consuming regions of the world.

Differences in distance to markets. Areas that are located near the large consuming markets have a marked advantage in commerce over the remote and outlying regions of the commercial world. Moreover, the distance factor also affects specific types of commodities. For example, some kinds of goods cannot be shipped long distances except at great expense. Thus perishable agricultural products, such as vegetables, milk, and certain kinds of fruit, are generally produced near the areas of consumption.

Differences in degree of economic development. In some countries, such as those of western Europe, and the United States, the high plane of economic development is reflected in large-scale modern manufacturing enterprises. Finished manufactures of great abundance and variety are produced at low cost. On the other hand, large parts of the world, such as most of Asia and Africa, have been retarded in their economic growth, and extractive industries predominate. Raw materials are sent from these less highly developed nations to the industrial countries of the commercial world in exchange for manufactured goods.

Differences in skill and education Peoples differ markedly in their capacity as well as ability to do different kinds of work. Some are industrious, others are non-industrious; some are enterprising, others are backward; some are intellectual, others are dull. The Japanese show extraordinary skill in the making of goods in which hand labor plays an important part. The French are known for

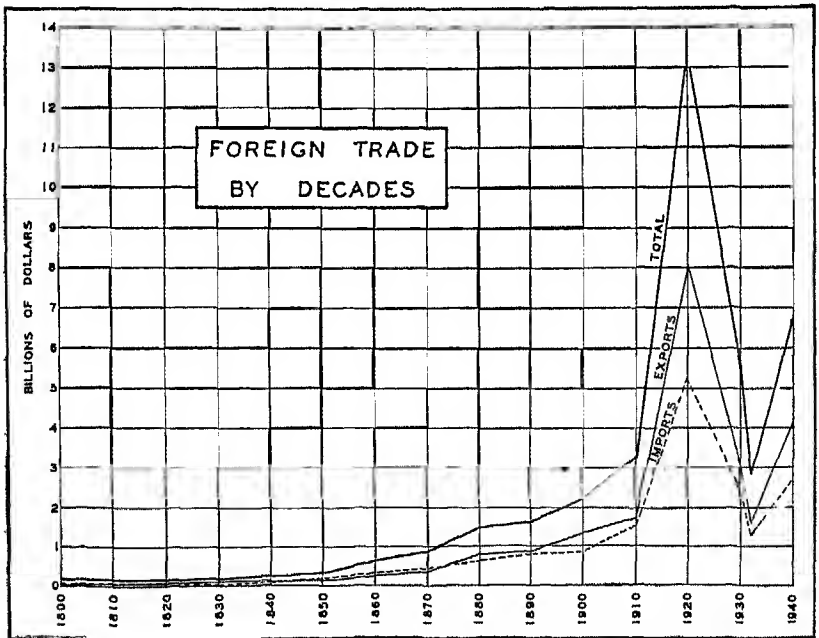
their artistic temperament and their skill and taste in art. The Germans are noted for their scientific skill and thrift, just as the Americans have established themselves as a resourceful and highly enterprising people.

Education plays an important part in the commercial world. It has been a fundamental contributing factor in the development of modern industry and commerce. In general the best educated peoples of the world are the ones which consume the greatest amount and variety of economic goods. Differences in education should, therefore, not be overlooked as one of the causes of world commerce.

FOREIGN COMMERCE OF THE UNITED STATES

Development of our foreign trade. The development of the foreign trade of the United States is closely linked up with the growth of our country and the increasing utilization of its natural resources. The earliest American trade (before the year 1700) was carried on by large trading companies of the Netherlands and England. These companies traded chiefly with Europe and the West Indies and sought cargoes of furs, fish, tobacco, and lumber. They brought manufactured products, such as clothing, tools, and household supplies, from Europe to the Colonies. These products continued to be important United States exports and imports up to and even shortly after the Revolutionary War. But with the invention of the cotton gin in 1793 our Cotton Belt soon became the chief source of our exports, and expanded rapidly up to the time of the War between the States. Moreover, during the three decades just prior to the war the internal or domestic commerce had surpassed our foreign commerce for the first time in American history. We had also developed a large merchant marine and carried more than two-thirds of our exports and imports in American vessels. But from the beginning of the War between the North and South to the time of the World War our merchant marine suffered a severe setback. In fact, by 1914 only 9 per cent of America's commerce was carried in American ships. Moreover, great changes were also taking place in the character of our trade. With the rapid development of our manufacturing industries, crude materials were imported in increasing quantities, and manufactured goods became leading items of export.

Recent trends in American trade. A study of the value of United States exports and imports indicates that our commerce during the World War period increased by leaps and bounds (Graph below) This increase in our world trade was due to the great demands for war materials in Europe and the high level of prices. Exports increased more rapidly than the imports. Moreover, our trade increased rapidly during this period because many countries in Latin America, Asia, and Africa were forced to break old, well-established foreign trade connections with Europe and accordingly increased their trade with the United States. Our foreign trade reached even higher peaks during the post-war period, and in 1920 reached the highest figure in the history of the country. This phenomenal growth of our foreign trade came to an abrupt end with the coming of the depression. Thus, after 1929, our trade slumped considerably and reached a low point between 1932 and 1934. Many factors contributed to this decline in our foreign commerce. Among the chief contributing factors were (1) foreign trade restrictions by many nations the world over, (2) sharp increases in tariff duties, (3)



The export, import, and total trade of the United States by decades from 1800 to 1940.

breakdown of world credit, and (4) the drop in the prices paid for merchandise in the leading markets of the world

Present importance of United States trade. The foreign trade of the United States has thus developed until we now rank second only to Great Britain in the commercial world. In fact, eastern United States has become one of the hubs of world commerce. It is one of the pivots about which world trade revolves. Together with western Europe it accounts directly and indirectly for approximately four-fifths of the foreign commerce of the entire world. Many foreign lands can satisfy the demands of their peoples and industries best by purchasing some of their merchandise in the United States. Similarly, we can best satisfy our domestic requirements by purchasing certain kinds of economic goods in foreign countries. There are some commodities which would not be consumed at all within the United States were it not for our foreign trade.

Comparison between foreign and domestic trade. Although the value of foreign trade surpassed that of domestic trade during the early period of American history, that is no longer true. During our Colonial period it was necessary to import great quantities of clothing, implements, and machinery. Our nation was young. We lacked the necessary tools and equipment. Restrictions imposed by England greatly retarded our development of manufactured goods. We therefore imported economic goods that were high in value and small in bulk. Foreign trade was much more important (in value) than domestic trade. At the present time, however, the internal or domestic commerce is much more important than the foreign trade. Statistics show that we export, on the average, only 10 per cent of all the goods produced within the country.

Importance of foreign trade to producers. Although our foreign trade constitutes only 10 per cent of our total trade, it is of great importance to American industries. The value and importance of foreign trade to individual producers is not difficult to understand. Many producers have found that they can increase their production by developing foreign markets for their products. Moreover, by developing world-wide markets for merchandise, some producers can keep their labor employed throughout the year. For example, manufacturers of summer wearing apparel can produce for the markets of the Northern Hemisphere during one season of the year and for those of the Southern Hemisphere during the opposite season.

Importance of foreign trade to certain industries. Foreign trade is not equally important to all American industries. Some of our industries depend in large measure upon foreign trade. Thus, within recent years we have exported approximately 50 per cent of the motorcycles and turpentine produced within our country. The cotton and raisin exports have exceeded 50 per cent of their total production. Approximately 40 per cent of the typewriters, 49 per cent of the prunes, and 34 per cent of the tobacco, kerosene, and copper produced within the United States are sent to foreign countries.

Importance of foreign trade to consumers. By means of foreign trade the people of our country can obtain many products which are not available within the United States. These include tropical agricultural commodities, such as bananas, cacao, tea, coffee, and rubber. Moreover, most of the tin, vanadium, chromium, tungsten, antimony, and nickel consumed by American industry is obtained from foreign countries.

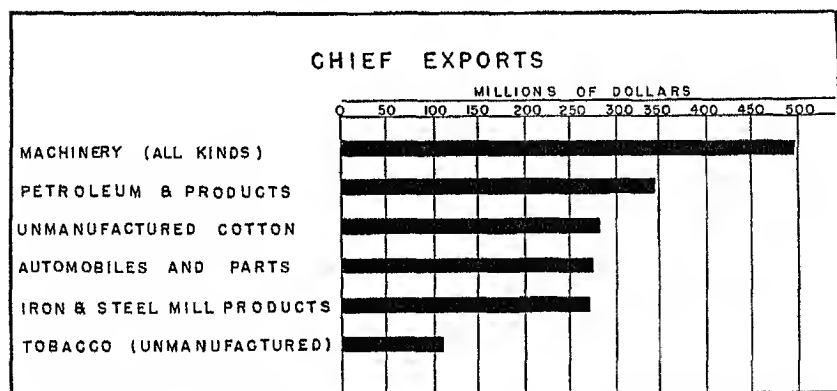
Trade balance of the United States. By trade balance we mean the ratio of merchandise exports to imports. When the value of the exports of a country exceeds the value of the imports, the trade balance is said to be *favorable*. On the other hand, when the imports exceed the exports, the trade balance is considered *adverse*. The fact that a country imports more than it exports does not mean, however, that the nation is unprosperous. The British Isles have had an adverse trade balance during the entire period of their greatest prosperity.

The United States had an unfavorable trade balance during the greater part of its history. The value of merchandise imports exceeded that of exports during most years prior to 1873. We were building a nation, and we consumed goods faster than we could produce them, consequently, we imported large quantities of merchandise from Europe. Moreover, some of the imports were obtained as payment for the services rendered by the merchant marine of the United States.

Since 1873 the exports have exceeded the imports in value. (Illus., p. 284.) During the World War and the post-war periods the greatly increased export trade was due in part to United States loans to foreign countries. With this borrowed money foreign nations purchased large quantities of goods from us. Frequently money is loaned to other countries with the understanding that they should use it in purchasing our goods. During the fifteen year period,

1914-1929, the total of our merchandise exports exceeded the total imports by more than \$26,000,000,000. Just think of it for a moment—\$26,000,000,000. This amount is more than the total favorable trade balance during the entire preceding history of our country. This fact is of great significance, not only to the American people, but to the entire commercial world. We had become the largest creditor nation in the history of the world. Before the World War we were indebted to other countries, that is, the United States was a debtor nation. Now other nations are indebted to us.

Exports of the United States. By reason of her high degree of economic development and abundance of basic resources, the United States has a definite advantage over other countries in the production of a number of commodities. The United States Tariff Commission lists about 200 such articles. The more important of these commodities are at present the leading exports of our country. Unmanufactured (raw) cotton has long been one of our chief exports in point of value. (Chart below.) Leadership in export of this commodity traces back to the first quarter of the nineteenth century. The United States is also one of the leading exporters of automobiles and automobile parts, gasoline, naphtha, leaf tobacco, and electrical machinery. In general, the United States has an advantage over other countries in the large-scale or mass production



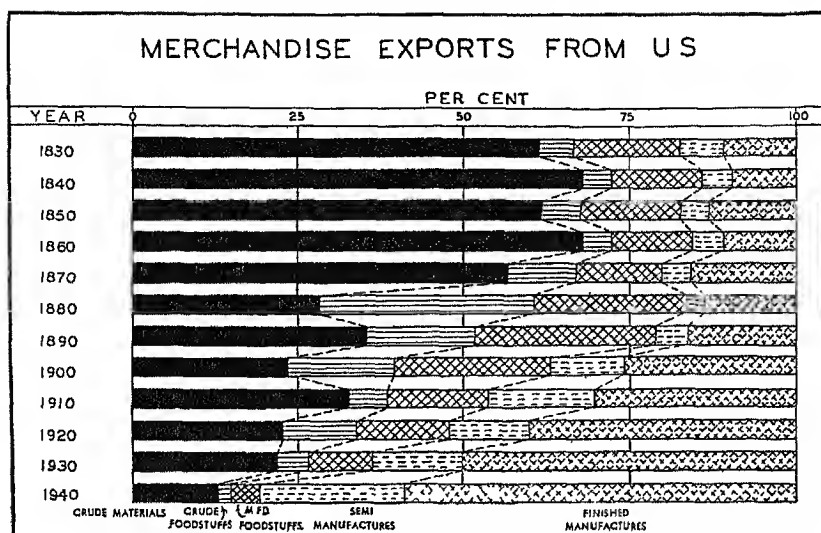
The leading exports of the United States during the period 1935-40. Note that various kinds of manufactures now rank among our leading items of export, which is in harmony with the trends in the merchandise exports from the United States, as shown on page 289. On that graph you will note a constant increase in the percentage of finished manufactures.

of machine-made articles. At the present time such goods constitute the most important group of exports.

Re-exports of the United States. Some of the merchandise that is imported into the United States does not remain here. It is sent to foreign countries, and constitutes re-exported goods. Such transshipment trade is relatively insignificant at the present time, although it made up nearly half of the total exports during the first decade of the nineteenth century. During the period 1801-1810, wars between England and France caused large quantities of British and French goods to enter neutral American ports. From our ports the merchandise was re-exported to British and French colonial possessions in the West Indies. Statistics show that our re-export trade at the present time amounts to no more than 2 per cent of the total of all exports. On the other hand, the re-export trade of some of the European nations makes up a considerable part of the total trade. For example, the Netherlands, Great Britain, and France find it convenient and profitable to collect such goods as rubber, tea, and other colonial products from their possessions. Some of these goods are later exported.

Changes in our export trade. A study of the United States exports by major groups of commodities shows a proportionate increase of finished goods and a decrease of crude materials. (Illus., p. 289.) During the early years of American history most of the exports consisted of crude materials, such as fish, furs, lumber, and tobacco. Even during the middle of the nineteenth century crude materials made up more than 60 per cent of the total export trade. But in 1940 crude materials constituted only 11.8 per cent of all our exports. Foodstuffs have also declined in proportion to total trade. This drop in percentage of foodstuff exports has been due to the increasing growth of manufactures and urban centers. Thus more food is used at home to satisfy domestic requirements. On the other hand, manufactures and semimanufactures have shown striking increases among our exports. The most phenomenal gains have taken place in finished manufactures, such as automobiles, machinery, gasoline, automobile tires, kerosene, and textiles. In 1940 finished manufactures constituted (in value) more than 59 per cent of all merchandise exported from the United States.

Imports of the United States. Although the merchandise imports do not retain the same position or rank from year to year, there are several commodities that normally appear as the leading items of

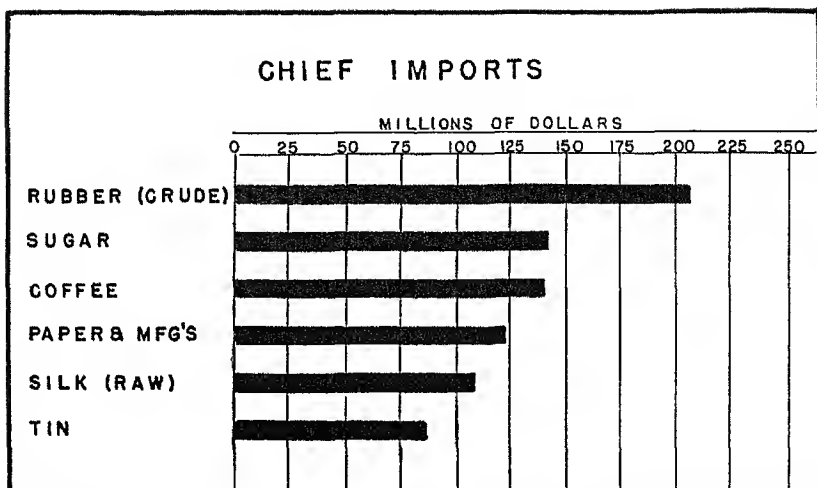


Graph showing the changes in the major classes of merchandise exports of the United States from 1830 to 1940. Note the gradual decrease in crude materials and the increase in finished manufactures.

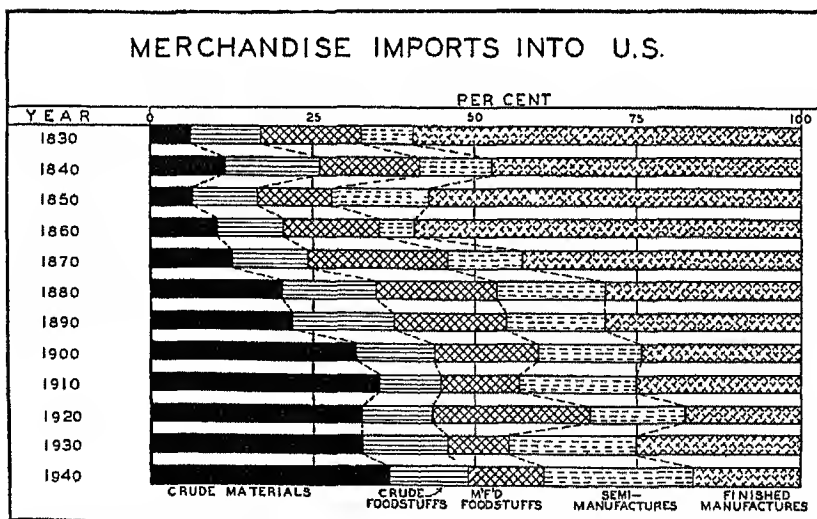
our import trade. In the production of these commodities foreign countries appear to have an advantage over the United States. This advantage may be due to climate, the abundance of a given resource, cheap labor, or any other factor or combination of factors that we studied in the first part of this chapter.

The leading imports of the United States include rubber, sugar, coffee, paper, silk, and tin (Top chart, p 290). The foreign output of the coffee, most of the cane sugar, and the rubber consumed each year in the United States is due mainly to the more favorable climatic conditions of certain outside areas for the production of these commodities. In the case of raw silk the labor factor is one of the chief points to consider. Thus Japan is the major source of the raw silk imported by the United States. That far-eastern country has a large amount of cheap labor. The workers have the necessary skill and experience in the making of silk. In addition, the climate is suitable for the production of the mulberry, the leaves of which are fed to the silkworms.

Changes in our import trade. Study the lower chart on page 290 and note the various major classes or groups of imports, such as



The leading imports of the United States during the period 1935 to 1940. These have also been leading imports for a longer period of time, although they may change in rank or order of importance from year to year.



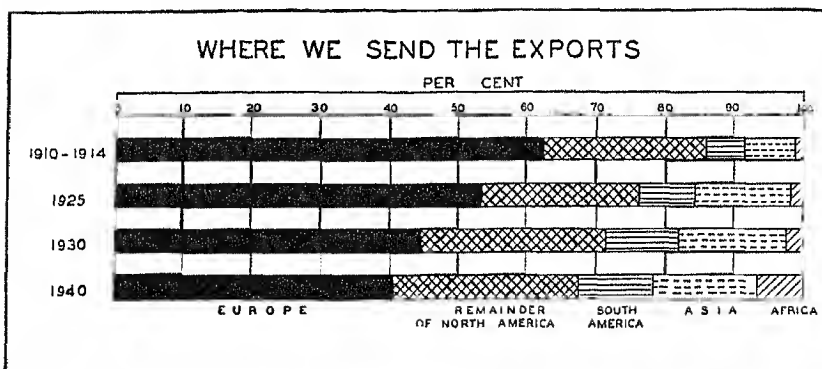
Graph showing the changes in the various major classes of merchandise imports of the United States from 1830 to 1940. Note the gradual increase in crude materials, and the decrease in finished manufactures

crude materials, crude foodstuffs, manufactured foodstuffs, semi-manufactures, and finished manufactures. The graph shows our imports of merchandise during a period of 100 years. It brings out the fact that the changes have been just the reverse of the changes for similar classes of exports. (Compare with graph, p 289.) Thus during the greater part of the nineteenth century finished manufactures made up more than 50 per cent of our entire import trade. Crude materials, however, played but a minor role as imports, and during the first half of the nineteenth century seldom exceeded 10 per cent of the value of all products imported. The graph shows that a striking change has taken place. Crude materials have increased, while finished manufactures have decreased, in terms of total import trade—a trend that is just the reverse of that shown among the main classes of exports. Such trends in trade suggest that the United States has become less dependent upon foreign countries for manufactured products, and that the expanding American industries have required increasing quantities of crude materials.

Seasonal character of our foreign trade. It is of practical value to exporters and importers to know the seasonal variations in our trade. During the months of lightest shipments freight rates tend to be lower than they are during the rest of the year.

A study of United States export trade shows that the seasons of greatest activity are the fall and winter months. This condition is about what one would expect because of the fact that the raw cotton and tobacco, the most important *raw material* exports, are harvested during late summer and fall. Moreover, exports of finished manufactures, which constitute the chief class of merchandise exports, are larger during the winter months than at any other season of the year. Foreign countries import American machinery, automobiles, and other finished manufactures in preparation for spring business and agricultural activity.

Where do we send our exports? Europe has always been our best customer, and even today we send more products to Europe than to any other continent. This is in harmony with the fact of trade given on page 283, that educated peoples consume the greatest amount and variety of economic goods. In line with the fact that educated peoples have more desires and demand more goods than uneducated, foremost among our European customers are the United Kingdom, France, Germany, and Italy. These are major cotton-importing countries, much of which is obtained from the United States. But

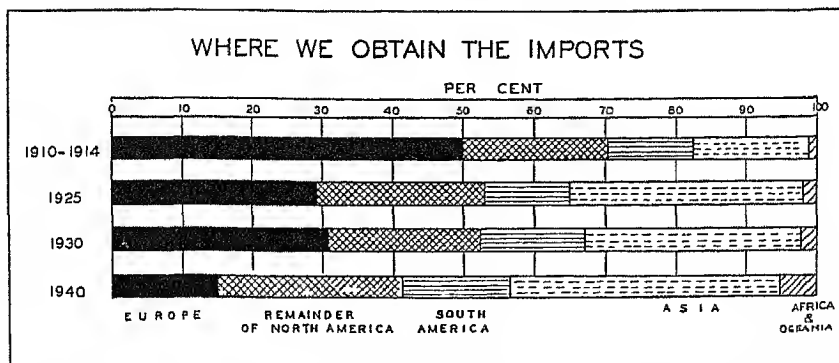


The United States export trade by continents. Note that Europe is by far the leading market for our exports.

Europe has declined in relative position among the purchasers of our goods. This relative decline is nicely indicated by the fact that Europe took 80 per cent of United States exports during the seventies of last century, more than 60 per cent just prior to World War I, and only 40.9 per cent in 1940. (Chart above) One of the chief reasons for this relative decline in our European trade has been the ever increasing development of manufacturing within the United States. We formerly depended chiefly upon European countries for certain types of manufactured products. Now our own manufactures are competing more and more with those of Europe. On the other hand, the continent of Asia has greatly improved its position as one of our customers, chiefly because of our increasing trade with Japan. Asia took but one per cent of our exports during the seventies of last century and more than 15 per cent in 1940.

Other parts of North America also take large quantities of United States merchandise exports. Our chief customer in North America is Canada. In 1940 Canada took more than 14 per cent of all the goods exported from our country.

Where do we obtain our imports? With ever increasing industrialization the United States is importing more goods from regions that produce a surplus of industrial raw materials. As we have already seen, the percentage of crude material imports has increased at the expense of finished goods or manufactures. Since the Orient has become one of the major raw-material producing regions, our trade with that part of the world has increased considerably. (Illus., p. 293.) In fact, in 1940 we bought more from Asia than



Note that Asia, the remainder of North America, and Europe are the chief areas from which we import.

from any other continent, chiefly because of the large imports of industrial raw materials, such as raw silk, crude rubber, and tin

TRANSPORTATION AS RELATED TO WORLD TRADE

Cost of transportation an important factor. Roads, railroads, waterways, and airways connect the regions of production and consumption. With the development of these means of transportation, the commercial world has grown. It is to be expected that further expansion in world commerce will be associated with a further development of the world's transportation systems.

Many districts, especially in Asia, Africa, and South America, lack the necessary means of contact with the outside world. Some of those districts contain valuable minerals, others possess dense forests, while still others have fertile soils. But how can such areas market their surplus products?

Other areas are provided with transportation, but it is primitive and expensive. For example, in China human carriers play an important part in the transportation system. The Chinese coolie carries heavy loads, and he works for very low wages, yet that type of transport is expensive. As compared with the railways of the United States, it costs about ten times as much to transport a one-ton cargo for a distance of one mile by means of coolie carriers.

Before the period of rapid and cheap transportation, people lived mainly unto themselves. They made their own clothing and imple-

ments, they produced their own food and feed. In many cases such economic goods could have been produced at lower costs in other places, but the poor transportation made it necessary for people to satisfy their varied wants by means of local or home production. With the growth of cheap modern transportation there has been an increasing tendency to produce commodities in regions that are best suited to their production. Thus we find the development of *regional specialization*—corn and corn-fed hogs in the Corn Belt, cotton in the Cotton Belt, spring wheat in the Spring Wheat Belt. With specialization a greater surplus of commodities was produced and world trade increased.

Railways and world trade. Many of the commodities exported to foreign countries move long distances over railroads. In fact, railroads are the chief means of long-distance transportation by land. They play a very important part in world trade. They offer the advantages of speed, large carrying capacity, safety, dependable service, and low cost of transportation. The greater part of the world's railway mileage is found in the two major commercial regions or hubs of commerce—eastern United States and western Europe. With 250,000 miles of railway line the United States is the leading country in this type of transportation. The large and well-distributed coal reserves in the interior of the United States furnish cheap fuel and power. On some of the railways, such as in our Southwest, the engines use fuel oil instead of coal.

Roads. Just as the United States leads in miles of railway line, so it leads in miles of road. With 3,065,000 miles of roads suitable for motor-vehicle traffic, the United States has an average of one mile of road for every square mile of land.

The roads not only make it possible for people and goods to reach the railway stations, but the motor vehicles which use the roads compete with the railways. For short-distance transportation by land, motor vehicles have become the most important means of transportation in our country. To an increasing extent they are also being used for long-distance transportation.

Inland waterways. Various commodities, especially bulky ones, such as grain, minerals, and timber products, often move long distances on our inland waterways. That applies to commodities handled in our foreign as well as domestic commerce. At the present time the most important of these inland waterways are the

Great Lakes, the Mississippi River and its major tributaries, and the New York Barge Canal.

During the early period of American history our colonists used the national waterways as practically their only means of communication with the interior. River channels were deepened and canals were dug in many areas. This expansion of our inland waterways took place until about 1830, when our first important railway line was laid. From then on the railway and later the motor vehicle proved to be more desirable means of transportation. Many of the waterways were put out of business. Railways and roads can be constructed nearly everywhere, even in mountainous regions, whereas navigable canals and rivers follow lowland courses. The use of waterways, therefore, often forces freight to take long, round-about courses. The depth of the water generally varies from place to place and from time to time. The channels of most rivers are shallow, shifting, and crooked. As compared with the railways and motor vehicles, waterway transportation is slow. Moreover, in regions that have very cold winters, the waterways are closed to navigation during a part of the year.

Airways. The airship and the airplane are recent developments in the commercial world. The progress in air transportation has been remarkably rapid, and we can expect even more striking developments in the future. At present, air transportation is important mainly as a means of speedy transfer of mail, valuable commodities of small bulk, and passengers.

Ocean transportation as related to foreign trade. About three-fourths of the world's surface consists of water, and major land masses are separated by vast expanses of water. These facts suggest the importance of ocean transportation in world trade.

The sailing vessel gives way to the steamer. Before the time of steam power, sailing vessels carried the commodities of commerce. But the sailing vessels rapidly gave way to the larger, more powerful, and more dependable steam-powered vessels. At the present time only a small part of ocean commerce is carried by means of sailing vessels. The steamer offers marked advantages of size and speed.

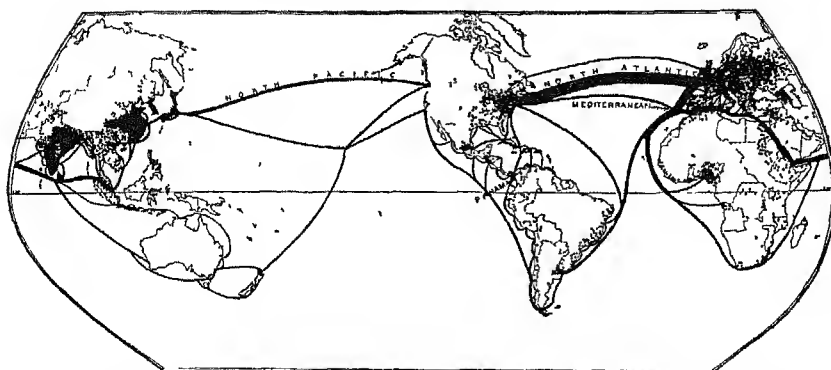
Increase of oil-consuming ships. To an ever increasing extent the commerce of the world is being carried in oil-consuming vessels. These have marked advantages over ships which use coal as the source of power. Oil can be stored in a smaller space; that is, less

cargo space is required for oil than for coal. The oil-burning vessels also travel greater distances before they must refuel. As compared with coal-burning vessels, they require only a fractional part as many workers to handle the fuel. Some ships which operate on oil require only one-tenth as many workers to feed the fuel to the engines as do coal-burning vessels of equal size.

Ocean liners and tramps. The seaborne commerce of the world is carried largely in two classes of ships—liners and tramps. The liners generally keep to set or fixed routes and schedules. Included in this class are the largest vessels afloat. Most of the world's commerce (in value) is carried in the holds of liners. These ships are also most important in carrying passengers and mail. On the other hand, tramp vessels carry commodities rather than passengers—chiefly bulky goods, such as coal, iron ore, grain, sugar, lumber, and pulpwood. Moreover, the tramp vessels do not follow fixed routes and schedules. A tramp vessel may remain abroad for a number of years, visiting many ports, before it returns to the place from which it started. In contrast to the fixed rates of liners, the rates of tramp vessels are competitive. They are determined by what the traffic can bear. For example, if the cargo is valuable and the exporter is unable to obtain someone else to haul it, the tramp vessel may realize an abnormally large profit from the shipping service.

Ocean trade routes. In spite of the vast expanses of ocean that may be crossed in practically any direction, trade tends to follow certain well-established major routes. There are many factors that affect the direction of these routes, notably the presence of producing and consuming regions, fuel supply, and land barriers. When sailing vessels were the most important carriers, winds and ocean currents also affected the course or direction of the ocean routes.

The North Atlantic Trade Route. A large part of the tramp and liner traffic of the world follows the North Atlantic Trade Route (illus. opposite). This route serves the world's major regions of industry and commerce—eastern United States and western Europe. As we have already seen, the United States exports more to Europe (in value) than to any other continent. Most of those exports are taken to Europe by way of the North Atlantic Trade Route. The greater part of Canada's export trade also follows this route. From the Colonial period to the present time the eastbound traffic over



Major trade routes Thickness of lines drawn in proportion to volume of trade. Note that the important trade routes—such as North Atlantic, the Mediterranean, and the North Pacific—connect the large population areas Each dot represents 500,000 people (Base map according to U S Dept of Commerce)

this route has consisted largely of industrial raw materials and foodstuffs. On the other hand, commodities that are comparatively small in bulk and high in value make up the greater part of the westbound traffic.

The North Pacific Trade Route. Although the North Pacific Trade Route is not so important as the North Atlantic, it has witnessed a remarkable development within the last 80 years. Japan had not opened her doors to world trade until after the middle of last century. But at the present time the leading commercial nation of Asia trades more with the United States than with any other country. This trade follows the North Pacific Ocean route. Like the traffic of the North Atlantic, the bulky trade is largely outbound (away from America). Most important of all commodities in this outbound traffic is cotton, which is sent largely to Japan. Other commodities include mineral oils, iron and steel, and machinery. On the other hand, the inbound traffic consists mainly of goods that are comparatively high in value and small in bulk. Of these commodities, silk, silk fabrics, foods, and tea are most important.

The Panama Canal. Constructed through the Isthmus of Panama, this canal is one of the most important in the world. Before the completion of the Panama Canal (1914) ships sailing between the eastern and western coasts of the United States were forced to go all the way around South America. This canal has greatly aided the water-borne trade between these regions. It is also much used in the trade between eastern United States and western South

America (Illus, p 297) Note on the map that the west-coast region of South America is practically directly south of the east-coast region of the United States The canal also handles much of the traffic between the west-coast region of the United States and Europe In addition, western Europe and eastern United States make much use of the canal in trading with the Far East

The Mediterranean-Suez Canal Trade Route The Mediterranean Trade Route is most used by European countries, although the United States also sends goods over this path of commerce. Ships which use this route in trading with Iraq, Persia, India, Ceylon, and other Oriental countries pass through the Suez Canal

The chief ports. At the ends or termini of ocean routes one finds the ports Here land routes and ocean routes meet The most important ports are those which contain good harbors, possess adequate facilities for handling commodities, and have a favorable location in reference to areas of production and areas of consumption

Ports that serve large producing and consuming regions tend to have a well-balanced traffic, that is, both imports and exports are important Such conditions are found along our east coast, especially at New York. But our gulf ports generally export more than they import, chiefly because of the large exports of petroleum and cotton What are the leading exports of our west-coast ports?

The port of New York New York is the greatest of all our ports and often handles more than one-half (in value) of our total import trade The factors that have made New York so important in our foreign trade are (1) New York has an excellent harbor (2) It occupies a favorable location with regard to railway contacts with the interior The Hudson-Mohawk Lowland is the only low break in the highland barrier in eastern United States. By way of this lowland New York has contacts with interior points by rail, road, and water (3) New York has excellent mechanical facilities for handling freight (4) It is favorably located in regard to America's largest and most important region of production and consumption.

QUESTIONS AND EXERCISES

1. Make a list of the separate items of food that you ate yesterday, and indicate the probable region from which each item was obtained
2. Explain how differences in climate, relief, and soils will often cause differences in world trade. Give examples.

- 3 What are the chief differences between the Chinese people and Americans in economic development, industrial skill, and education? How have these differences affected the foreign trade of these countries?
- 4 Trace in general terms the character of our trade from the Colonial period to the present time
- 5 Give reasons why foreign trade is valuable to the United States in spite of the fact that it accounts for only 10 per cent of our total trade
- 6 What is meant by (a) favorable trade balance (b) an adverse trade balance? What caused the extremely large favorable balance in the United States trade between 1914 and 1929?
- 7 What changes have taken place in our export trade?
- 8 Name the six leading items of our import trade From what countries do we import these commodities?
- 9 Among the continents, Asia now ranks first as a source of our imports Name the chief items imported from Asia
- 10 Give reasons why the Great Lakes constitute one of the chief inland waterways of the world Base your answer on a study of the location of the Great Lakes with regard to certain types of raw materials, on the one hand, and markets on the other Note also the direction of the Great Lakes as a whole
- 11 If you were an American exporter, over what trade route would you send goods to (a) Belgium, (b) Palestine, (c) North China, (d) Chile?
12. Make a list of commodities that move eastward on the North Atlantic Trade Route
- 13 Make a list of commodities sent to Asia by way of the North Pacific Trade Route Name some commodities that move in the opposite direction over that route
- 14 How do social conditions influence the development of Commerce? (Read Quinn, James A , *Institutions of the Social World*, pp 150-175)

FURTHER READINGS

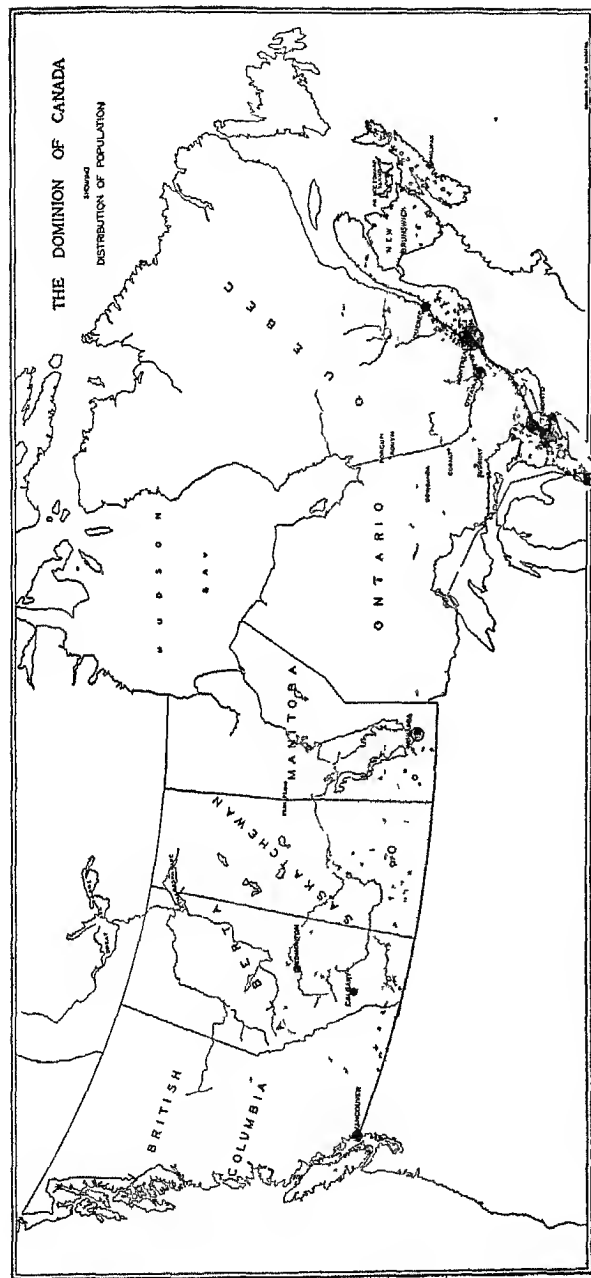
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CANADA AND NEWFOUNDLAND

A vast area of diverse resources. Canada, with an area of 3,500,000 square miles, is the third largest country in the world. If Newfoundland be added, the area is almost 4,000,000 square miles. The area of Canada and Newfoundland is surpassed in size only by the Soviet Union and China. Unfortunately, 85 per cent of its area is tundra, forest, mountains or barren rocky land, yet the remaining 15 per cent, suited to agriculture or pasture, represents more than 500,000 square miles. This is more than twice the area of any country in Europe except the Soviet Union. Moreover, the great forested area of Canada and Newfoundland contains a wealth of timber and pulpwood, a great variety of minerals, fine furs, and an abundance of water power. Even the Tundra is capable of supporting tens of millions of reindeer, and the neighboring ocean borders are rich in fish. Canada is, indeed, a country of great possibilities.

Slight development. At present this great country is sparsely populated and but slightly developed. More than one-half of the entire population of Canada lives within a narrow strip of land which extends from the city of Quebec to southwestern Ontario. More than 95 per cent of the people of Canada live within 300 miles of the American-Canadian boundary line. Thus, the populous portion of Canada is a long narrow strip of land lying close to the southern boundary of the country (Map opposite). Eighty-five per cent of Canada is practically without population. The Northwest Territories and Yukon—one-half of Canada—have a population of less than 15,000 people. Most of these are Eskimos who live along the shore of the Arctic Ocean, or miners who seek precious metals in highly isolated parts of this desolate land. One might travel for hundreds of miles within the interior of the Northwest Territories without seeing a human being. With minor exceptions, then, Canada is undeveloped except along the southern border. Even within this narrow zone, many of the resources are either undeveloped or but slightly utilized.

Location of Canada and Newfoundland. These countries, like the United States, stretch from the Atlantic to the Pacific. Unfortunately



The populous part of Canada is a long narrow strip of land lying close to the southern boundary of the country
Size of circles varies in proportion to the population

Population of Principal Cities in Canada

Montreal	618,506	Hamilton	114,151	Calgary	63,305
Toronto	521,893	Ottawa	107,845	London	60,959
Winnipeg	179,087	Quebec	95,193	Edmonton	58,821
Vancouver	117,217			Halifax	58,372

the greater part of the land lies far to the north, and experiences long, cold, white winters. These countries, taken together, are bathed on the north by the cold waters of the ice-laden Arctic Ocean. Their eastern shores are bathed by the cold waters of the Labrador Current. Along the southern border, for a distance of 3,000 miles, stretches the friendly United States. The west is bordered by the warm waters of the Pacific and by Alaska.

Protected on three sides by oceans and on the fourth by a friendly nation, Canada and Newfoundland have been free from invasion by enemies for more than a century. With no need for a large army or a powerful navy, the Canadian people have been able to give most of their energies to the peaceful pursuits of commerce and industry.

Canada possesses an excellent location for the development of commerce. It faces the great industrial nations of Europe on the east, it joins the world's greatest industrial and commercial nation on the south, and is open to the Orient on the west. The Great Lakes and the St. Lawrence River provide excellent natural highways to the east. Thus the most populous parts of Canada have easy access to the greatest markets in the world. The western outlets of Canada are somewhat difficult to reach from the east. A lofty, rugged barrier—the Rocky Mountains—lies between the most productive portion of the country and the west coast. Railroad building and highway construction across this mountain chain is difficult and expensive.

Unfortified boundary. Between the United States and Canada stretches the longest unfortified boundary in the world. Neither nature nor man has thrown any major barrier between these two countries. From the Great Lakes westward, the international boundary extends across plains, rivers, mountains, and valleys, without regard to natural barriers. Along this line there is nothing to indicate the boundary of two great nations except scattered signposts with "United States" written on one side and "Canada" on the other.

The United States and Canada have agreed that neither country will ever build fortifications along this boundary. Neither will they make preparations for military activities along this line, nor develop navies on the Great Lakes. This agreement has been faithfully kept by both countries. The similarity of races, languages, and ideas within the two countries is a natural bond of friendship. The close economic association of the two countries has also helped to cement

the nations together in lasting friendship Under such conditions there is no need for this boundary to be fortified

Peoples of Canada. During the Early Colonial period of America, the French settled in the St Lawrence Valley and in other parts of eastern Canada When Canada was ceded to the British in 1763, the French remained in their newly adopted home and became British subjects As a result, about one-fourth of the population is made up of French-speaking people

Since 1763, when Canada became the possession of Great Britain, most of the immigrants have come from the British Isles or from the United States After our own frontier disappeared, thousands of Americans crossed into Canada each year to take up the fertile but cheap land. This movement has been primarily into the Prairie Provinces, Alberta, Saskatchewan, and Manitoba During the last 35 years more than 1,000,000 Americans have moved into the Prairie Provinces and at present make up a large percentage of the population of this region Most of these people have relatives living within the United States Consequently, family ties may be counted on to help bind this part of Canada to the United States in lasting friendship

Factors that have handicapped Canadian and Newfoundland development. It may surprise you to learn that Canada and Newfoundland are one-fourth larger than the United States but have less than one-tenth as many people Several factors have contributed to this undeveloped condition of the country The most pronounced of these handicaps are (1) adverse climates, (2) large areas of infertile or scant soil; (3) the greater attraction of the United States for immigrants.

Adverse climates More than one-fourth of Canada may be classified as tundra, where winters are long and cold, and where summers are short. Over a large part of this area the soil freezes so deep during the winter that it never completely thaws out during the summer. Winter temperatures of -50°F to -70°F are frequently recorded.

The Northern Forest has but slightly milder climate than that of the Tundra The winters are less severe; the summers are a little longer and warmer; and the precipitation is a little greater Near Dawson, Yukon, the ground thaws only a few feet deep during the summer Below this shallow surface zone is eternal ice. The trees can send their roots but a few feet deep since the roots cannot pene-

trate frozen ground. Even under such conditions the trees may grow to be 50 feet high and 12 or 14 inches in diameter. Near the northern border of the forest the trees grow exceedingly slowly and never become large—many of them never exceed 10, 15, or 20 feet in height.

In the central and southern part of the forest, as at Fort Hope, the summers are longer and the winters are less severe. Even here the trees grow slowly. Yet they finally attain sufficient size for the development of the lumber and pulpwood industries. Even agriculture is carried on within parts of the Northern Forest.

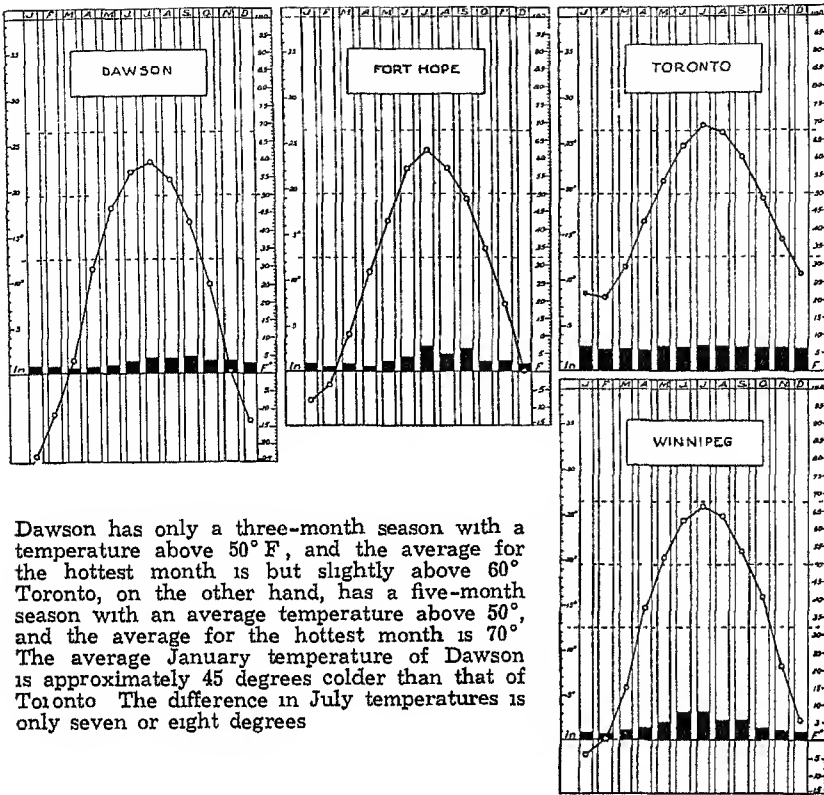
Within parts of southern Canada, as at Winnipeg and Toronto, the frost-free period lasts from four to six months, and much of the land is well suited to agriculture.

Infertile or scant soils. Much of Canada has been covered several times by glaciers—great ice-sheets which were hundreds of feet thick. These glaciers pushed southward and scoured much of the soil off large sections of the country, leaving the rock bare. Since the occurrence of the last glacier, large areas have never again possessed fertile soils. At best, soil is made by nature very slowly (see p. 117) and it may be carried away by running water or wind as rapidly as it forms. This has happened in parts of Canada.

European emigrants came to United States instead of going to Canada. During most of the nineteenth century (1800-1900), many of the emigrants from Europe sought the United States rather than Canada. There was no need of going to a land of cold winters while more pleasant and even more fertile lands were undeveloped. After our own frontier disappeared, even American citizens have turned to Canada in search of homes or of economic opportunities. During the next few decades we may expect to see Canada develop more rapidly than ever before.

REGIONS OF CANADA

The Tundra. In the northern part of Canada, extending from the Arctic Ocean to the forests, lies an immense expanse of Arctic meadow—the Tundra (Illus., p. 306). This Tundra, which occupies approximately the northern one-fourth of Canada, is a land of moss, lichens, and flowers. The winters are long and cold, but the summers are short and intense. At latitude 70° north, the sun does not set for 73 days. Temperatures of 80° to 90° F. are not uncommon, and temperatures of 100° F. or more have been experienced several times.

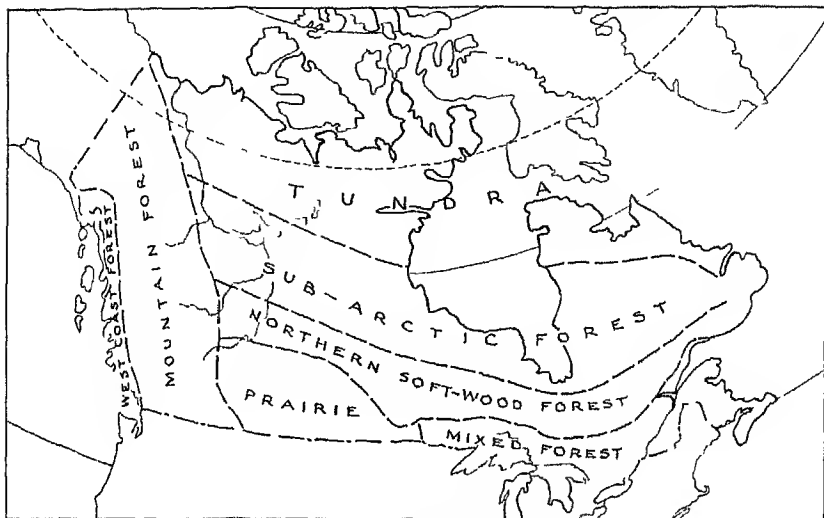


Dawson has only a three-month season with a temperature above 50° F., and the average for the hottest month is but slightly above 60° Toronto, on the other hand, has a five-month season with an average temperature above 50°, and the average for the hottest month is 70°. The average January temperature of Dawson is approximately 45 degrees colder than that of Toronto. The difference in July temperatures is only seven or eight degrees.

The average temperature for July, the hottest month, ranges from 50° F. to 60° F. In other words, the average temperature of the hottest month, July, would be uncomfortably cool for most of us. Compare the July temperatures with the temperature of your school-room. The summer period is aided by the fact that the days are long—18 to 24 hours each—whereas the nights are merely twilight.

During the short but intense summer period, vegetation grows rapidly. Then, almost without warning, comes winter with its long night, extremely cold weather, strong winds, and frequent blizzards.

A desolate waste. Today the Tundra is a great barren waste. The difficulties of settling the region are many. It is bounded on the north by the ice-filled Arctic Ocean and on the south by a great wilderness, the Northern Forest. Consequently, it is an isolated region. During the summer the land is infested with swarms of mosquitos and other insects. Finally, the adverse climatic conditions of the Tundra prevent the growth of food crops.

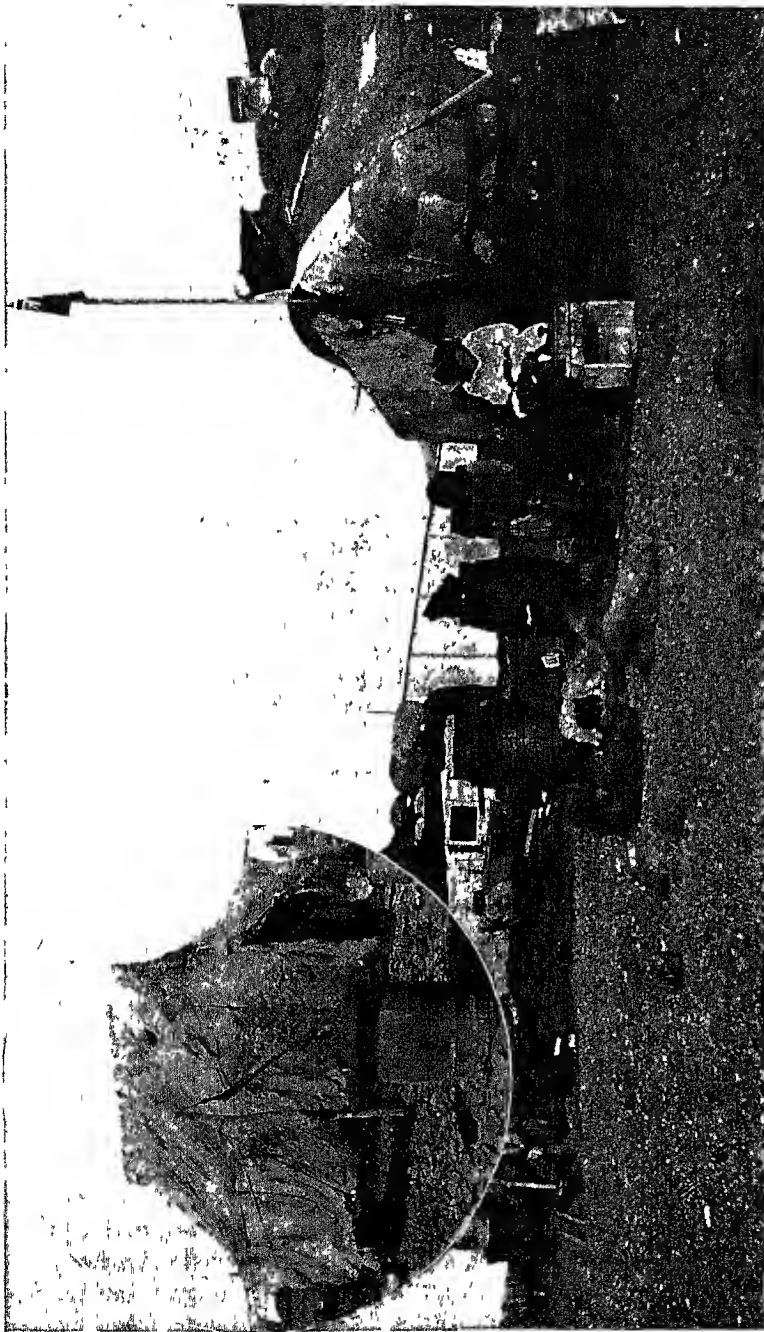


Major natural regions of Canada.

Although the region is practically without population except along the Arctic shore, it may some day support a few hundred thousand people. It is a land where formerly millions of caribou and musk ox roamed at will. These hardy animals were able to withstand the tormenting insects of summer and also the severe blizzards of winter. During the last few decades these animals have been ruthlessly slaughtered, until only small remnants of the vast herds of former days still remain. The reindeer is now being introduced to take the place of the rapidly disappearing caribou and musk ox, but many decades will pass before the Tundra will again support as many animals as it did formerly.

Peoples. The Tundra of Canada is the home of approximately 8,000 Eskimos, who live along the shore of the Arctic Ocean and gain their support from the sea. These Eskimos live in villages ranging in size from three to ten families each. There is a rather widespread belief that most of the Eskimos live in snow houses, but this is not true. Practically all Eskimos now live in houses built of stone, moss, or driftwood, or in tents made of seal skins. Many explorers who have traveled extensively in the Tundra, and who have lived for years among the Eskimos, have never seen a snow house.

The food and clothing of the Eskimo is obtained from the sea.



The winter home of the Eskimos is made of wood, moss, and skins. The summer home (in circle) is made of seal skins. (Courtesy Dept. of Interior, Canada.)



The seal is life itself to the Eskimos. The animals supply food, clothing, bedding, heat, and sometimes shelter for the Eskimos.

Seal meat is the staple food, and seal skins provide most of the clothing, although caribou and musk ox hides and certain furs are also used. Seal skins are also valuable for the making of boats and for bedding.

From the economic viewpoint the Tundra is of but little value at present.

The total imports and exports of the entire area amount to only a few thousand dollars annually. However, the recent introduction of the reindeer on the Arctic slopes of Canada has raised hopes that the region may some day support many more people than at present. Some explorers who are best acquainted with the Tundra have estimated that some day 30,000,000 reindeer may be pastured in this land. If such hopes are fulfilled the world's food supply will be increased materially.

THE FOREST

A great wilderness. Approximately 1,600,000 square miles of Canada are covered with forest. Most of this vast area has much the same appearance today that it had when the white man first set foot on this continent. Large areas have never been fully explored, and almost a million square miles of forest land are unoccupied except for trappers, traders, prospectors and occasional explorers (Illus., p. 309.) It is only in the southern and western borders of the forest that wood-working industries are being developed. In widely scattered areas mining is being carried on. Throughout most of the area waterways are the only routes of transportation. Thus most of the great forest is a wilderness that is seldom visited except by the trappers who are seeking furs.

Hunting and trapping. The only industries that are representative of the entire Canadian forest are those of hunting and trapping wild game and of gathering the furs for the world market. The forest with its cold winters is the natural home of the beaver, bear, fox, ermine, marten, skunk, otter, mink, and many other animals.



A large part of the Northern Forest is a great wilderness, uninhabited except for the lonely trappers and traders (Courtesy Forest Service, Dept of Mines and Resources, Canada)

that yield high-grade furs. Since some or all of these animals are found in every section of the Canadian forest, no part of this vast area is without its fur industry.

The home of the Indian. This land, with its abundant wild game and its many rivers and lakes suitable for use as highways, was the home of many Indian tribes when the white man first arrived. These Indians hunted wild game with the aid of snares and other crude equipment. They ate the meat of many kinds of animals and used the furs for the making of clothing, bedding, and tents. To supplement their food supply, they fished in the streams and lakes and gathered a few berries and wild fruits.

Indians were traders. Most of the great forest area of Canada is covered with a network of rivers and lakes. These were used by the Indians to make long journeys by canoes. On these journeys they frequently traded with other tribes. True, this trade was limited largely to exchange of one kind of fur for another, or to the exchange of furs for foods or trinkets.

The fur industry. In large sections of the Canadian forest, conditions are much the same today as they were 500 years ago, except for the changes brought about by commerce in furs. The region is still sparsely populated by Indians and a few French and Indian half-breeds. During the long, cold winters these people are thinly scattered over the great forest area where they trap fur animals.

About the only products of civilization that they possess are steel traps, guns, and a little machine-made clothing. They may also obtain small supplies of flour, salt bacon, salt, cigarettes, and minor quantities of other foods. These are purchased at the time of the summer journey to the trading post. The entire winter's supply for a family can usually be carried in a single canoe, with spare room for passengers.

These Indian trappers lead lonely lives during the winter. They cannot call a doctor when some member of the family is sick. There may be no doctor within hundreds of miles, and even the nearest neighbor may be several miles distant. A few years ago a member of an exploring party was troubled by a toothache while traveling in this great forest. He learned that there was no dentist within hundreds of miles. The party had no forceps with which to extract teeth nor sedative with which to deaden the pain. The patient had to suffer as the Indians do under similar conditions.

The Indian trappers and their families are glad to see summer arrive. This is the happy period for all. In the spring when the ice breaks up, the Indians load their winter's catch of furs into canoes and take them to the trading posts. Here they meet hundreds of other Indians who have come to the post for the same purpose. During the summer, many of the Indians spend their time loafing about the trading post. In recent years, however, an increasing number of Indians and half-breeds work in mines or lumber camps, or act as guides for hunters, prospectors, or tourists.

Unfortunately, a large percentage of the Indians spend most of their earnings for candy, cigarettes, strong drink, or other products that are of little value to them. Moreover these products are sold to the Indian at extremely high prices. Most of the trappers find themselves in debt to the fur post when fall arrives. All too soon, signs of approaching winter cause the Indians to return to their lonesome hunting ground once again. Having squandered their money during the summer, many of them receive credit from the trading post for their winter's supply of the products of civilization.

These few Indians, together with a smaller number of French and Indian half-breeds, gather a considerable share of the world's fine furs. They receive only a few dollars apiece for their labor. When, however, the furs which they have gathered are finally made into clothing, they are worth many million dollars. Most of this money has gone into the pockets of the traders, manufacturers, and

merchants, while the poor Indians receive but little pay for their work.

The steel trap and the rifle have aided the Indian and the white man in overexploiting the fur-bearing animals of Canada. This has resulted in a decrease in the supply of furs—especially of fine furs. The wild bison which roamed the prairie and forest borders is gone forever, and the wild beaver and marten are rapidly being depleted.

However, the fur trade of Canada is in no danger of extinction. With the possible exception of Siberia, Canada is still the largest natural fur-animal preserve of the world. The area which will continue to furnish peltries, after settlement has planted its furthest outpost, will still consist of nearly a million square miles. Moreover, as the wild life decreases, fur farms are being developed, in order that the world's fur markets may be supplied.

Fur farming. The high price of certain furs, together with the discovery that fur-bearing animals can be successfully reared within enclosures, has led to the development of fur farming. The fox has proved to be the best suited for domestication. Yet the mink, raccoon, skunk, marten, and fisher are all being successfully raised in captivity. There are now several hundred fox farms and scores of other fur farms in Prince Edward Island and neighboring parts of southeastern Canada. In recent years the pelts from ranch-bred animals represented in value approximately one-third to one-half of the output of the entire Dominion.

Types of forests. Based upon present and potential utilization, the Canadian forest may be divided into five great regions. They are as follows: (1) the Sub-Arctic Forest; (2) the Northern Softwood Forest; (3) the Southern Mixed Forest (softwood and hardwood), (4) the Western Coastal Softwood Belt; and (5) the Interior Dry-Belt Softwood Forest.

The Sub-Arctic Forest. The Sub-Arctic Forest is of no commercial value today, and probably never will be. The trees are small and grow exceedingly slowly. In the northern part of this forest belt many of the trees, as a protection against the wind, bend over until the trunks lie almost on the ground. Trees more than 100 years old may be less than six inches in diameter. Even in the southern section of this sub-Arctic zone, the trees seldom grow to be more than 18 or 20 inches in diameter. The slow growth of the trees and the small size tend to reduce the value of the forest, but the isolation is an

even greater handicap to commercial exploitation of the lumber or pulpwood products. Moreover, it is not necessary as yet for the industrial world to import its wood products from such remote and isolated areas. Better forests than this one are located close to the great industrial sections of Canada and the United States, where the bulk of the commercial wood products are utilized. As a result, it will be many decades before the forest products of this zone will be exploited. Perhaps they will never be utilized, except locally.

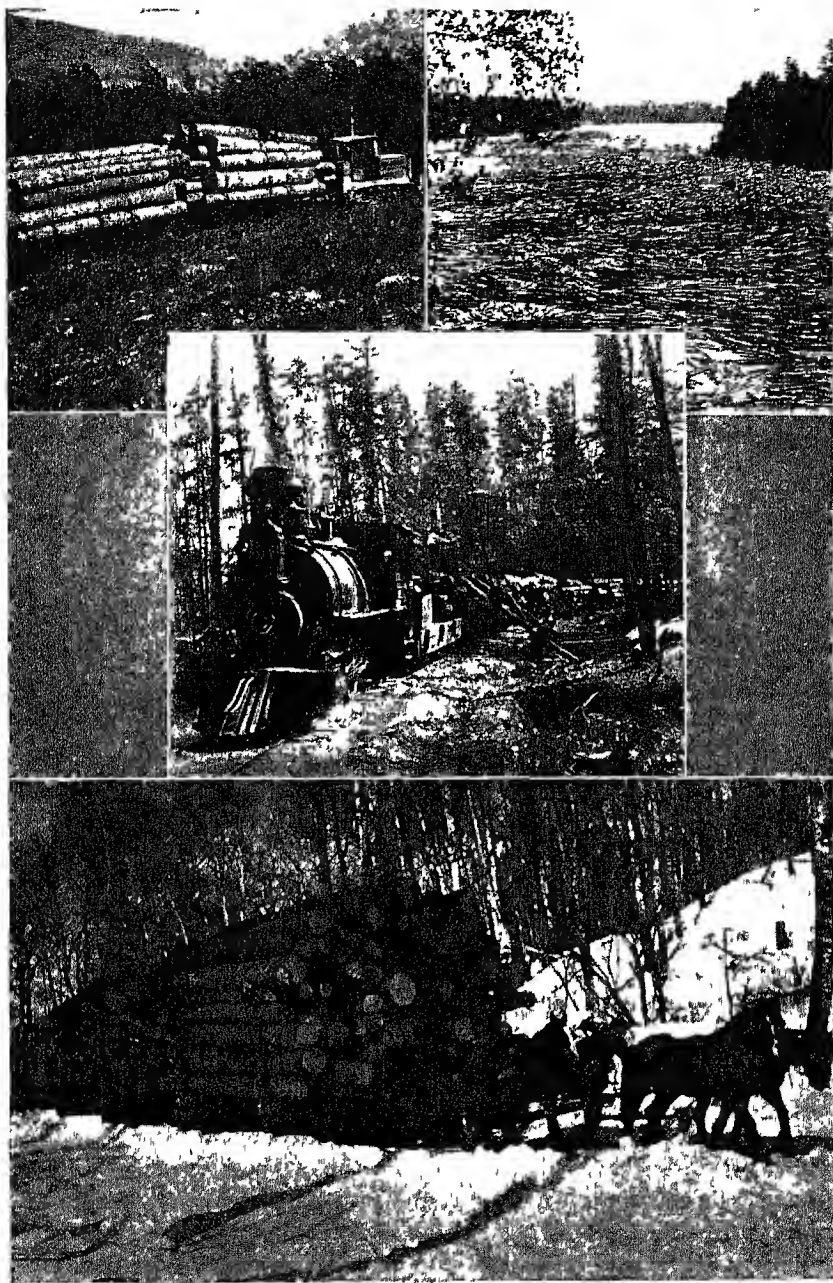
The Northern Softwood Forest. The forest products of this belt are practically unused at present. No lumber or pulpwood is shipped out of this vast zone except along the southern border. Pine lumber is produced in the forest area bordering the prairies and shipped into the neighboring farming region for the building of houses and barns, and for other construction purposes. The pulpwood industry is beginning to push into this area in parts of Ontario and Quebec. Most of the present Canadian supply of pulpwood is, however, produced in the northern part of the mixed forest which lies south of the Northern Softwood Forest.

Although the Northern Softwood Forest is of but little commercial value today, it will probably be one of the chief sources of pulpwood within a few decades. The region is close to the populous parts of Canada and is penetrated by several railroads. As soon as the forests which lie farther to the south show signs of being badly depleted, the paper companies will undoubtedly turn to this northern forest for raw materials.

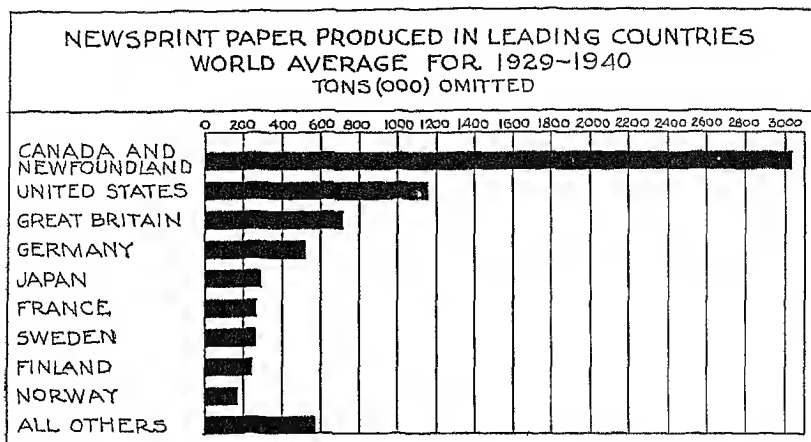
The Southern Mixed Forest. Although designated as a mixed forest, it is composed largely of softwood species, with relatively small numbers of hardwood trees, except along the southern border. This mixed forest zone is an important source of lumber and firewood, but it is noted chiefly for its production of pulpwood, wood pulp, and paper. This is the greatest pulp and paper manufacturing region in the world.

FOREST INDUSTRIES

Wood pulp and paper production. In the old days paper was made from rags gathered from homes and factories. For nearly a century, however, paper has been made from wood. In fact, during the last few decades wood has been the chief raw material for the manufac-



Four methods of transporting logs by tractor, by water, by train, and by sled
(Courtesy Forest Service, Dept of Mines and Resources, Canada)



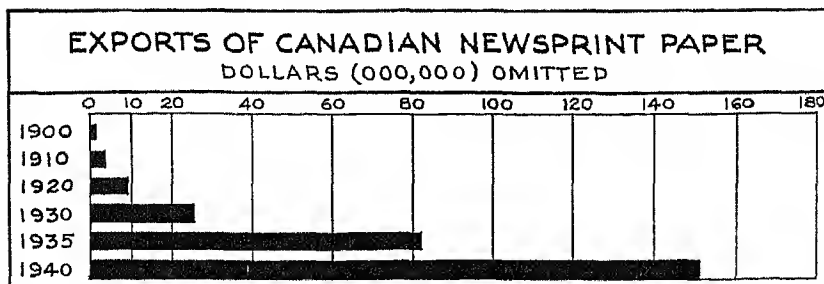
Canada, Newfoundland, and the United States produce more than one-half of the newsprint paper of the world

ture of paper The softer kinds of wood, especially spruce and fir, are used extensively for this purpose.

Southern Canada is ideally suited for the manufacture of wood-pulp and paper. This region is abundantly supplied with fine spruce forests; it has an unlimited supply of water which is needed in almost every operation of pulp and paper manufacture; and it is rich in water power, which is so necessary for the economic production of pulp and paper. Finally, the region is close to northeastern United States, where the largest printing and publishing centers of the world are located. For example, a single Sunday edition of the New York Times requires tons of paper, and many times this amount is used each Sunday for the publication of many other papers printed in eastern United States.

Exploitation of the forest easy. During the winter months, thousands of woodmen are busy chopping down the spruce trees, trimming off the branches, and cutting the trunks of the trees into logs. These logs are piled high on sleds, trucks or trains, and hauled to the mills or to the banks of streams to await the spring thaw (Illus., p 313) When the ice breaks up and the streams are swollen with spring rains and melting snow, millions of logs are floated to the pulp and paper mills which are located farther down stream. Here the logs are floated into large ponds or into quiet waters of a lake, where they are held until they are needed.

It is not surprising that, with all of these advantages for paper



Since 1900, the Canadian exports of newsprint paper have increased rapidly

manufacture, Canada and Newfoundland should be the world's largest producers of newsprint. A study of the illustration on page 314 indicates that three countries—Canada, Newfoundland, and the United States—produce more than one-half of all of the newsprint manufactured in the entire world.

Prior to 1900, Canada exported large quantities of pulpwood and wood pulp to the United States to be manufactured into paper. At that time, the Dominion did not export much paper. During the last few years it has been found to be more profitable for both Canada and the United States, to complete the manufacturing processes close to the forest, and to export paper rather than the raw products. Consequently, the Canadian export of newsprint has increased at a rapid rate. In 1940, the value of this export was 45 times as great as in 1900. During this same period the export of pulpwood decreased.

Lumber industries. Many of the trees of eastern Canada are too small to make good lumber. The Western Coastal Softwood Belt, however, possesses one of the finest forests in the world. Here the Sitka spruce, Douglas fir, and red cedar trees grow to heights of 100 to 250 feet. No other part of the world possesses such magnificent forests except the neighboring parts of the United States and Alaska (Illus., p. 316). The Douglas fir sometimes attains a diameter of more than 10 feet, and it may be 100 feet to the first large branches. In some places the timber yields enough lumber to cover the same land with five-room cottages, if each one were built on a lot of 50 by 150 feet.

The red cedar is well suited for the manufacture of shingles, and British Columbia has become one of the most important centers of wood-shingle production in the world. During the last few years,



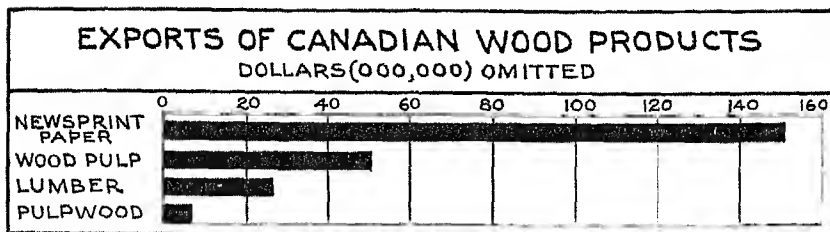
The most magnificent forests of the world are found in western Canada and neighboring parts of the United States (Courtesy Forest Service, Dept of Mines and Resources, Canada.)

however, the demand for fireproof construction materials has resulted in a decreasing demand for wood shingles and in an increasing demand for shingles made of slate, asbestos, or other nonflammable materials

Although the lumber production of Canada is an important and growing industry, it is still relatively small compared with the paper industry

Other wood products.

Although Canada's forests are primarily known for their valuable paper and lumber production, the wood is used for many other purposes. During the 10 years, 1926 to 1936, the average value of the firewood produced compared favorably with the value of the pulpwood and the logs for lumber, before manufacturing processes increased their value. Many other uses were found for forest products. For example, railroads and telephone companies of Canada annually purchase millions of dollars worth of logs which are used for railway ties and telephone poles.



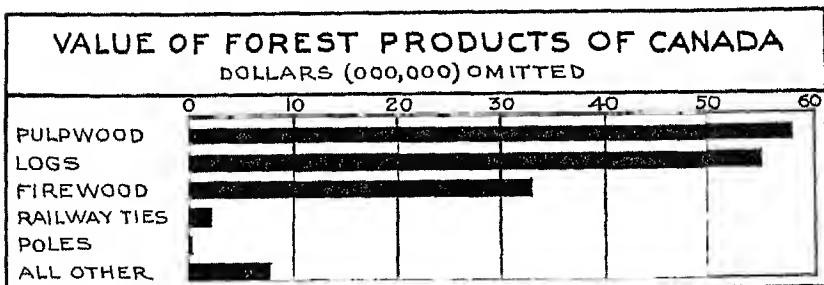
Canada manufactures most of her wood pulp into newsprint at home. However, considerable quantities of wood pulp are still exported. Data for 1940.

WATER POWER

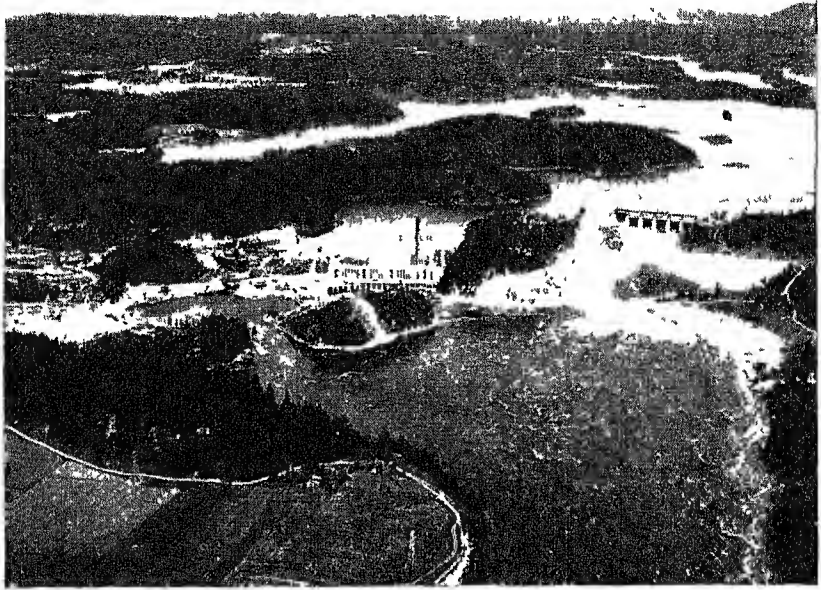
In the struggle for economic advancement, an abundant supply of cheap and efficient power is always considered an essential raw material. Power has been called the soul of commerce and industry. The major sources of power at the present time are mineral fuels—coal, petroleum, and gas—and falling water.

Canada is abundantly blessed with both coal and water power. Unfortunately, the coal supply of the dominion is somewhat remote from the region of densest population and greatest industrial activity. But an abundant supply of water power, called "white coal," exists in those regions where the needs for it are greatest.

Throughout Canada there is an abundance of available water power. In many places this power can be developed very cheaply. In large parts of the country the dense forests and numerous lakes cause the flow of the streams to be remarkably uniform throughout the year. (Illus., p. 318) Numerous streams contain natural waterfalls. Niagara Falls is the most famous of these natural water-power



Canada is the largest pulpwood and paper manufacturing country in the world. Most of the logs are used for the manufacture of pulp and paper. Data for 1941.



In large parts of Canada, the dense forests and numerous lakes cause the flow of the streams to be remarkably uniform throughout the year. Picture shows Pagan Falls Power Development (Courtesy Dominion Water and Power Bureau, Canada)

sites of eastern North America (Illus., p 319) There are, however, thousands of other falls in Canada suitable for water-power development. Many of the streams of eastern Canada have cut canyon-like valleys through solid rock. The rock bed and side of such streams provide excellent foundation and attachments for dams. Under such conditions man can provide his own waterfalls at a relatively small cost.

Since many of the industries of Canada need an abundance of power, the people have been inspired to develop their water power to the point where the country now stands first among all the nations of the world in the per capita production of hydroelectric power.

Relation of water power to the pulp and paper industries. The heavy machinery for the manufacture of pulp and paper is operated almost exclusively by hydroelectric power. Falling water is the only source of cheap power in the major pulpwood forests. Innumerable falls are scattered throughout the Canadian forests, and the cost



Niagara Falls is the most famous of the natural water-power sites of eastern North America (Courtesy Dominion Water and Power Bureau, Canada)

of developing hydroelectric power is relatively small. It is doubtful if power can be obtained more cheaply in any other part of the world. It is reliably reported that some of the pulp mills secure their power for only one-tenth of a cent per kilowatt-hour. That is less than one-fortieth part of the price paid for electricity in lighting many American homes. Of course it should be remembered that pulp mills consume large quantities of power, whereas the ordinary home consumes only a few thousand kilowatt-hours per month.

The advantages of developing the pulp and paper industries near the sources of both wood and power have been recognized not only by the Canadian manufacturers but also by American industrialists. Many large American newspaper companies have built mills in the Canadian forests, have purchased or leased thousands of square miles of forest land from which to obtain their pulp wood, and have developed hydroelectric plants to supply the needed power for pulp and paper manufacture. As a matter of fact, Canada's electric power industry and her pulp and paper industries have developed together, and are dependent upon each other for their present state of prosperity.

Relation of water power to mining industries. Large amounts of power are essential to every branch of the mining industry. In Canada the mining industry is even more dependent than the paper industry upon falling water as a source of power. Many of the mines

are hundreds of miles from coal fields, and some of them have exceedingly poor transportation facilities connecting them with the outside world. Under such conditions, the cost of importing coal for the development of steam power is almost prohibitive. In practically all cases, however, hydroelectric power can be economically developed at some neighboring falls, and the power cheaply transmitted by wire to the point needed.

Hydroelectric power is used to operate almost every mine in Canada. It is used in digging the shafts, in operating the elevators, in crushing and pulverizing the stone, in smelting the ore, and in refining the metal. The presence of this cheap and widespread power is one of the major factors in permitting Canada to take a prominent place in mining among the nations of the world.

Water power and manufacture. Certain manufacturing industries have been attracted to Canada almost wholly because of its vast resource of cheap power. This is especially true of the aluminum and some of the chemical industries. For example, power is the most important raw material used in the manufacture of aluminum. It requires a tremendous amount of power to extract aluminum metal from bauxite (aluminum ore). Consequently, the aluminum smelting industry always locates close to cheap power.

A few years ago one of the large aluminum companies of America decided to build a factory on the Saguenay River, where waterfalls and rapids provided an abundance of power. At that time the region was an uninhabited wilderness. Cheap power was the only attraction of the site selected. But because of this cheap power the company built factories, hydroelectric plants, and houses, and provided transportation facilities for the region. The bauxite from which the aluminum is extracted is shipped in from British Guiana; the aluminum products are shipped to all parts of the world.

In much the same way nitrogen plants, electric steel foundries, and other manufacturing industries requiring cheap power have been attracted to Canada.

QUESTIONS AND EXERCISES

1. How do Canada and the United States compare in size and population?
2. Locate the 10 largest cities of Canada. How many factors can you list that have favored the growth of each of these cities?
3. Suggest several reasons why Canada is sparsely populated.

4. List the advantages and disadvantages of Canada's location
5. Compare the effect of glaciation in Canada with its effect in the Corn Belt of the United States
6. If you were compelled to live either in the Tundra or in the Northern Forest, which region would you select? Why?
7. How have living conditions of the Indian trapper of the Northern Forest been changed during the last 300 years?
8. Which is growing more rapidly, the wild-fur industry or fur-farming? Why?
9. What are the major industries of the Canadian forest? Which ones of these industries seem to hold great promise for the future?
10. What factors have favored the rapid development of the hydroelectric industry of Canada?
11. What is the relation of the water-power industries of Canada to other industries of the country?
12. Write a composition on one of the following subjects
 - (a) A Visit to a Paper Mill
 - (b) A Visit to a Hydroelectric Plant
 - (c) Why I Should Like to Visit the Northern Forest or the Tundra.
 - (d) The Home Life of an Eskimo
 - (e) The Home Life of an Indian Trapper.

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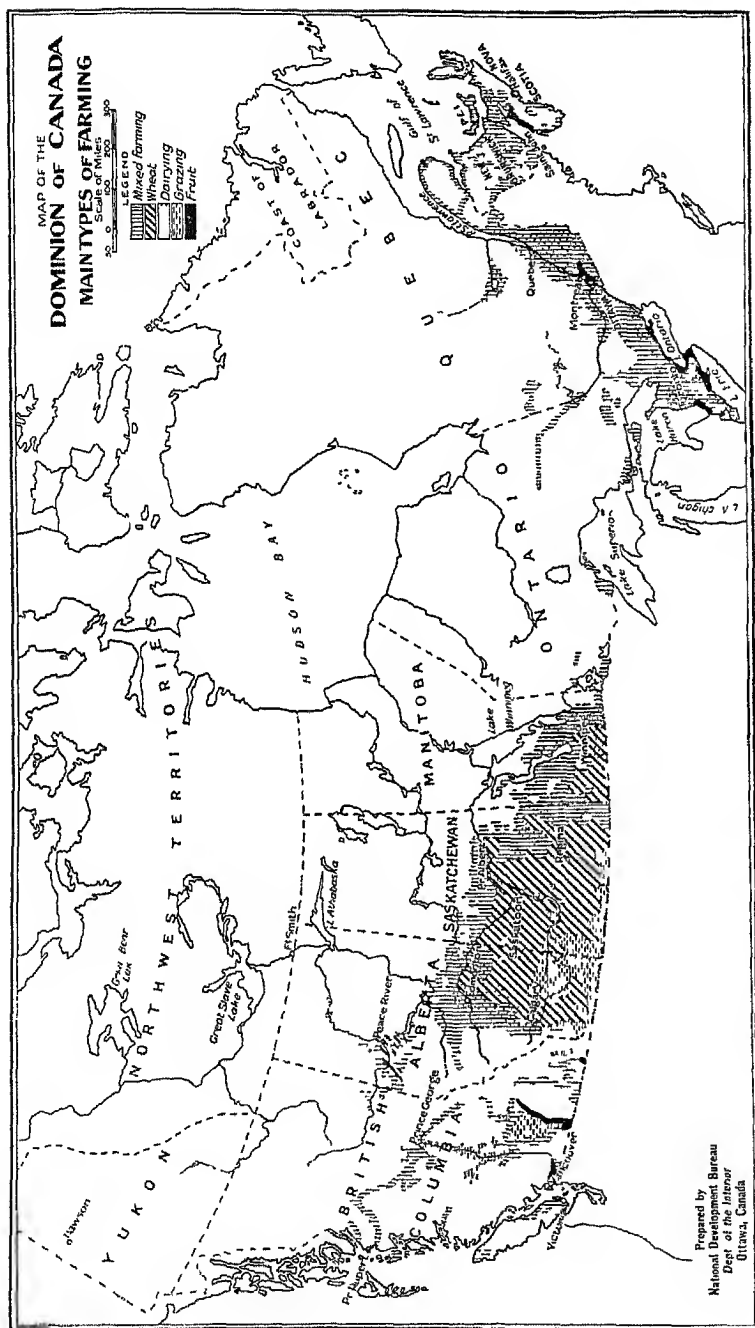
AGRICULTURAL REGIONS

Importance of agriculture. Most of Canada is a great wilderness. Yet its present agricultural and pastoral acreage exceeds that given to such uses in any country of Europe except Russia. Moreover, the prospects for further agricultural development are bright. It has been estimated that Canada possesses 360,000,000 acres of temperate-zone land suitable for crops and grazing. At present about 100 million acres of land are used for these purposes. Agriculture is the most important occupation of Canada. It surpasses any other industry both in the number of people employed and in the value of output.

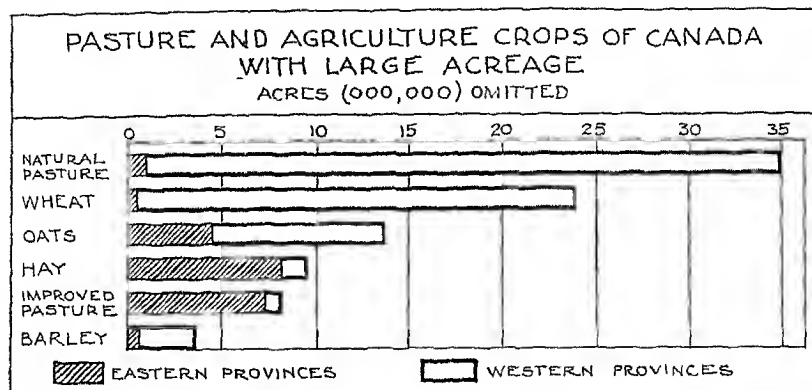
Distribution of agriculture. The farm land is scattered from the Atlantic to the Pacific, and the crops are grown in regions having a great variety of climates, soils, and types of topography. A study of the illustration on page 323 indicates two large farming regions and several smaller ones. About 55 per cent of the cultivated area lies within the Prairie Provinces of Alberta, Saskatchewan, and Manitoba. About 30 per cent of the cultivated land lies in southern Ontario and Quebec, while British Columbia and the Maritime Provinces possess 15 per cent of the agricultural land.

It may be noted in the illustration on page 324 that the acreage of pasture and crops within the western provinces greatly exceeds that within the eastern provinces. Yet the value of farm output of the eastern provinces exceeds that of the western provinces except during years when the price of wheat is unusually high. In fact, the value of Ontario's crops alone sometimes exceeds that of all of the western provinces combined.

Agriculture of the East contrasted with that of the West. The illustrations on pages 324 and 325 indicate that the farmers of the eastern provinces practice intensive agriculture and grow crops that yield a relatively large return per acre, whereas the farmers of the western provinces, especially of the Prairie Provinces, practice extensive farming and grow crops that yield a low return per acre. It



Agricultural regions of Canada (Courtesy Natl Development Bureau, Canada)

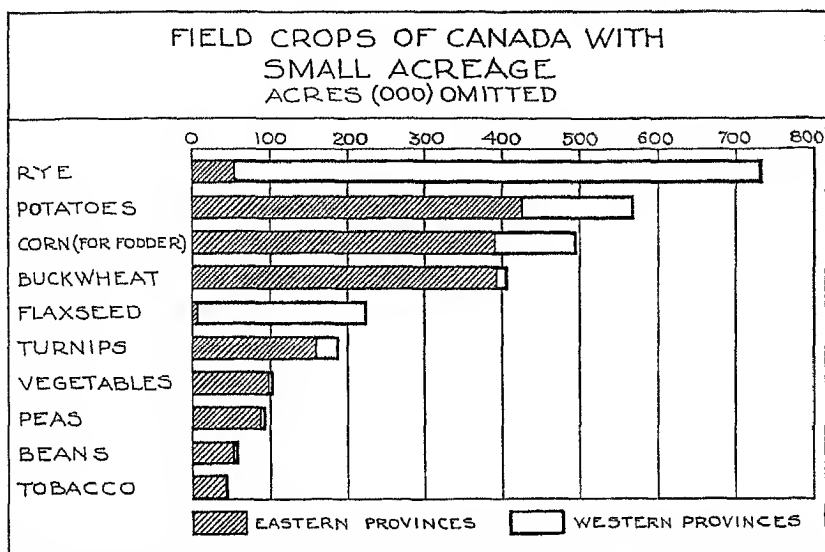


Most of the natural pasture and grain crops are grown in western Canada, whereas most of the improved pasture and hay are grown in eastern Canada. Figures for 1934.

must be remembered, however, that the expansion of agriculture is taking place much more rapidly in the West than in the East. The amount of fertile land in the East is small, and most of it is already under cultivation. The acreage of fertile land in the West is large, and much of it has never been brought under cultivation. Consequently, within a few decades, or perhaps within a few years, the Prairie Provinces will become the most important agricultural section of Canada, both in the acreage of crops sown and in the value of the crops harvested.

Study the charts on this page and the next and you will note that the Prairie Provinces are famed for their vast acreage of unimproved pasture and for their extensive cultivation of cereals. The pasture requires no care, and the cereals are grown with the aid of large-scale machinery. The region is still sparsely populated, labor is scarce, and there remains a large acreage of uncultivated land. These conditions, together with the level topography, tend to encourage extensive methods of agriculture. Large-scale machinery replaces man power.

On the other hand, the agricultural sections of the eastern provinces are relatively densely populated, labor is abundant, good farm land is scarce, farms are small, and much of the land is rugged or rocky. Since this agricultural area is close to the industrial areas of Canada, large quantities of food products are needed locally. These conditions tend to encourage intensive agriculture. Crops are grown



Crops that require a lot of human effort per acre are grown in eastern Canada, whereas crops that require but little human effort per acre are grown in western Canada. Figures for 1934 (Compare with the chart on page 324)

with the aid of small-scale machinery, and the amount of human labor expended per acre is large.

Agriculture in eastern Canada. Eastern Canada was one of the first regions of North America to be settled. Only a small amount of good farm land exists in this area, and consequently most of it was taken up by settlers several decades ago. This agricultural region is close to the great industrial section of Canada and of the United States. It also has easy access to the great markets of western Europe. Thus the position is well suited to the growth of perishable foods and to the development of dairying. Fortunately, climate and soils also favor the development of these industries.

The dairy industry. The St. Lawrence Lowland, although small in extent, is one of the finest dairy regions of the entire world. Almost every farm has its herd of dairy cattle. The region has a large acreage of improved pasture for summer grazing, and grows an abundance of hay, fodder, and oats for winter feed. Fresh milk and cream are supplied to the industrial areas of eastern Canada, and large quantities of butter and cheese are produced primarily for the local market. The total annual value of all dairy products of



Rural Ontario Contrast type of machinery used, size of farms, and apparent density of population with the prairie provinces. (Illus, p. 330) (Courtesy Govt Motion Picture Bureau, and Dept of Interior, Canada)

the eastern provinces is estimated at more than \$100,000,000. Formerly, large quantities of dairy products, especially of butter and cheese, were exported.

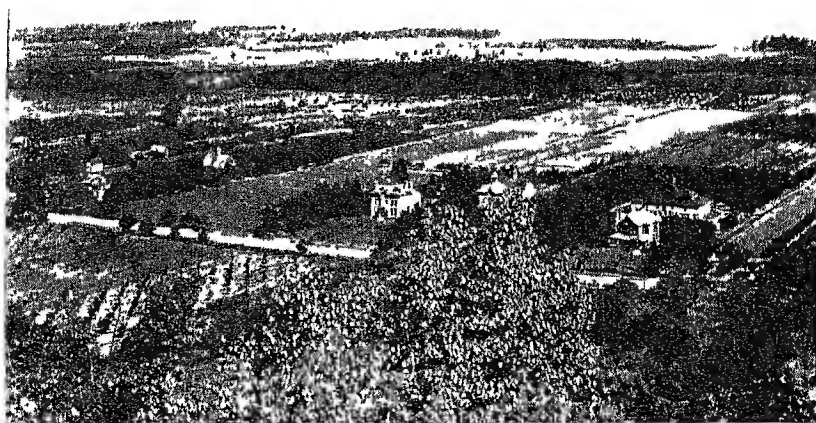
During the last 20 years there has been relatively little room in the St. Lawrence Valley for the expansion of dairying. The number of cattle supported within the region in 1936 was no greater than in 1916. Although there has been no increase in the number of dairy cattle during the last two decades, there has been a substantial increase in the industrial population of this region to be supported. Moreover, standards of living have been markedly raised with a somewhat corresponding increase in the per capita consumption of dairy products. As a result, the export of dairy products has declined sharply.

Diversified agriculture. The St. Lawrence Valley is a region of diversified agriculture, and is especially given to the growing of potatoes, vegetables, beans, peas, turnips, and other food products for local consumption. The most notable exception is tobacco, grown as a commercial crop.

Fruit culture. Fruit is grown in several small areas that are especially protected from unseasonable frosts. The Annapolis Valley of western Nova Scotia is especially renowned for its apple crop. Find Nova Scotia on the map of Canada. This valley, approximately 100 miles in length, contains many low rolling hills which result in good air drainage. It is also protected by the winds from the Atlantic Ocean and from the Bay of Fundy. The fruit crop of this region is remarkably reliable, and the yield of apples has at times surpassed 600,000 barrels annually.

Other fruit-growing areas are found in the St. John Valley of New Brunswick and near the shores of Lakes Erie and Ontario. Of these areas the Niagara District is most important. You will note, by studying the illustration on page 323, that this narrow neck of land is almost surrounded by water. As a result, the climate is so equable that it is suited not only for apples but also for grapes, peaches, plums, and other fruits.

Agriculture in the Prairie Provinces. Bigness is one of the most notable characteristics of agriculture in the Prairie Provinces. It is a land of big farms, big machinery, big grain elevators, big ranches, and big hopes and aspirations. Many of the farms of Saskatchewan contain thousands of acres, and the average holding is more than 300 acres. A single wheat field may contain thousands of acres and



Fruit farms near Gimsby, Ontario. Many of the fruit farmers are exceptionally prosperous. Note the fine houses. (Courtesy Canadian Govt Motion Picture Bureau.)

be several miles long. Much of the land is prepared for seeding with the aid of tractors that hold gang plows, 40-foot harrows, and equally large seeders, the grain may be cut with binders pulled by horses, or it may be harvested with great combines that cut swathes 12 feet wide and thresh the grain as it is cut.

Wheat farming. Wheat is the major crop. The chief varieties grown are the Red Fife and Marquis. Both are known as hard wheat and bring top prices in the world markets.

Because of the large-scale farming and the sparse population, most of the wheat produced is destined for export. The excellent railroad system and waterways of the country, together with the excellent harbors on both the Atlantic and Pacific Oceans, make it possible profitably to ship the wheat to markets several thousand miles distant.

The farmer takes his wheat to the nearest grain elevator, where it is stored for a short time (Illus., p. 330). Then it is shipped by railway to the huge elevators located at Vancouver, Prince Rupert, Fort Churchill, or to such Great Lakes ports as Port Arthur and Fort William. At these large elevators the wheat is handled with modern machinery. Great steamers are loaded with 5,000 tons of grain within a few hours. It is this use of modern machinery and excellent transportation facilities that enables the farmers to sell their wheat at a profit in distant parts of the world.

Livestock industry. The wild grasses of the Prairie Provinces



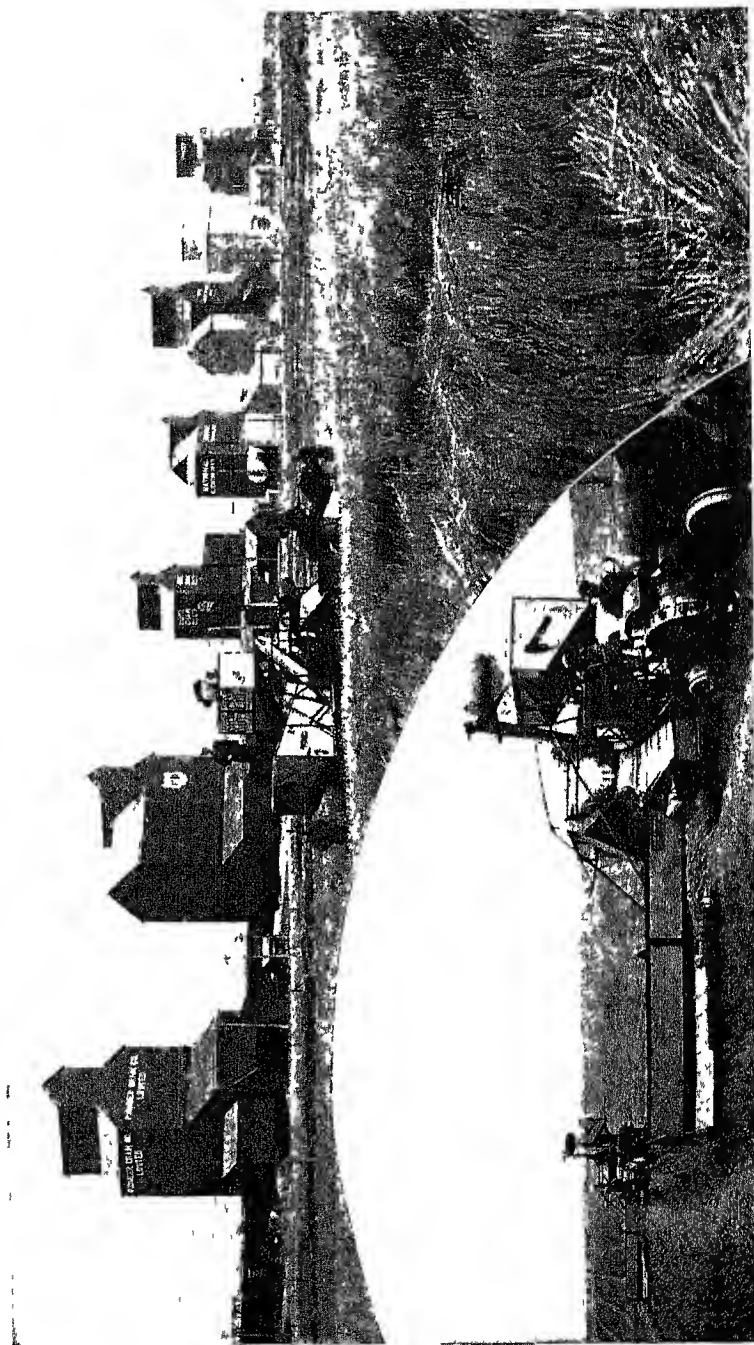
Disking and seeding in western Canada. The Prairie Provinces are noted for their extensive agriculture. (Courtesy Dept. of Immigration and Colonization, Canada.)

provide excellent pasture for horses, cattle, and sheep. In many parts of the area large ranches preceded agriculture. With the increase in population and the improvement in transportation facilities, many of the large ranches have been broken into farms, and the rancher has pushed into the rugged areas or to the borders of the agricultural region. The Prairie Provinces still support some of the largest and finest cattle ranches in the world.

The rancher of Canada has his troubles, and the profits from most of the ranches have not been large. The winters are cold, and proper care of livestock requires warm barns; lumber for building purposes must be shipped into the prairies and is expensive, and snow may cover the ground for weeks together, making it necessary to feed the cattle, horses, and sheep for protracted periods of time.

South-central Alberta is at present the most important ranch area of Canada. Here the rainfall is light and agriculture is scarcely profitable. Fortunately this region experiences warm winds from the Rocky Mountains, known as "chinooks," which make the winter weather warmer than it would otherwise be. They also melt the snows and make winter grazing possible. Thus the chinooks reduce the need for winter feed. The foothills of the Rocky Mountains are well suited to the development of the ranch, because the cattle can be driven to higher pastures during part of the summer, thus saving the lowland pasture for fall and winter.

Irrigation and the rearing of pure-bred stock. Although Alberta still possesses many fine cattle ranches, the reclamation of millions of acres of dry land by irrigation is causing many ranches to be



Bigness is a characteristic of Canadian Prairie Province agriculture Above, grain elevators, located along a railroad Insert, two men with a combine They can cut and thresh 40 to 60 acres of wheat a day (Courtesy Dept of Interior, Canada)



Herds of pure-bred cattle graze on the many ranches of Alberta (Courtesy Dept of Interior, Canada)

broken into farms. The farmer is now moving into areas where once the open ranch stretched for scores of miles. Fine irrigated fields of alfalfa, wheat, and vegetables now dot the landscape where once the unbroken prairie extended as far as the eye could see. Pure-bred cattle such as the Hereford, Durham, and polled Angus now graze on improved pastures. These cattle are no longer exposed to the severe storms of winter weather. Neither are they compelled to depend on the winter pasture of the open range. Instead they are sheltered in warm stables and fattened on alfalfa, corn ensilage, and other nutritious feeds.

The former "cow towns" of Alberta, once famous for their "round-ups," have been turned into manufacturing centers. They are now noted for their meat-packing plants, flour mills, and butter and cheese factories. They are also distributing centers for food, clothing, farm machinery, saddles, fuel, automobiles, and so forth, for the neighboring agricultural and ranch population.

Fruit production of British Columbia. British Columbia is noted for its fruit production. Many of the valleys, protected by mountains from the cold winds of the interior and supplied by irrigation waters from neighboring mountains, are especially well suited to the pro-



The Okanagan Lake district is the most famous apple-growing section of British Columbia (Courtesy Dept of Interior, Canada)

duction of hardy types of apples The Okanagan Lake District is the most famous of the apple-growing sections of British Columbia.

THE MINING INDUSTRY

Vast mineral resources. More than 80 per cent of Canada is as yet poorly mapped and almost wholly unprospected for minerals. Yet many extensive deposits of valuable minerals have already been discovered. The Porcupine Camp of Ontario is one of the largest gold producers in the world. The Rouyn District of western Quebec contains huge quantities of copper-gold-zinc ore and has already become one of the important copper-producing areas of the world. Furthermore, huge deposits of copper ore are being developed at Flin-Flon and neighboring areas in northern Manitoba. Practically all of the world's nickel supply is obtained from the nickel-copper mines of the Sudbury District of Ontario. Rich silver mines are operated at Cobalt and Gowganda, both in Ontario. The largest asbestos mines of the world are located near Asbestos, Quebec. Extensive deposits of iron ore have been located north of Lake Superior and not many miles from the greatest commercial iron ore deposit of the world—the Mesabe iron ores of Minnesota.

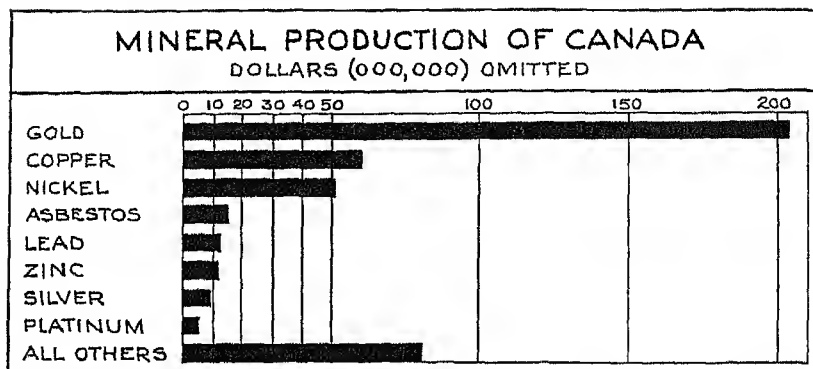
This list of ores includes only a few of the major minerals of Canada. The country contains more known coal reserves than any other nation in the world with the exception of the United States. It is relatively rich in petroleum, natural gas, radium, and many other minerals.

The prospects for future discoveries of metals. Most of eastern Canada is known as the Laurentian Plateau. It is a land of exceedingly old rock. During the last billion years or so these rock beds have been folded, faulted, and eroded; and many of the rock beds have been heated or otherwise disturbed by volcanoes and hot underground waters. Mountains as high as the Alps have been thrust up and then slowly worn down to near sea level. These processes tend to separate gold, copper, iron, and other metals from the rocks and to concentrate these metals in ore bodies rich enough to be mined. Thus, the ancient rock regions of the world are usually rich in metal ores. Since the Laurentian Plateau is one of the largest ancient-rock regions in the world there is reason to believe that it contains a wealth of metals.

Unfortunately much of this vast area is covered with forests, lakes, swamps, or glacial debris. Under such conditions prospecting for metals is difficult, and as a result, the mineral wealth of most of the region is unknown. Yet in almost every area where prospecting has been carefully done, metal ores have been discovered. These facts lead some experts to believe that, when the Laurentian Plateau has been more thoroughly prospected, it may become the "great treasure house of the world."

The mountain highlands of British Columbia and Yukon are also areas of geological upheavals, mountain building, vulcanism, and circulation of hot waters. As previously noted, these processes tend to separate metals from common rock and deposit these metals in ore bodies rich enough to be mined. For example, during millions of years, gold-bearing rocks have crumbled and decayed, and the lighter materials have been washed away, leaving the heavier materials such as gold, gravel, and sand in the beds of the streams. As a result, placer mining of gold—washing gold from sand and gravel—has been an important industry in British Columbia. For similar reasons these mountainous regions are rich in other metals.

Thus it has been seen that the Laurentian Plateau and the western mountain region of Canada are areas of valuable metal industries. Furthermore, they are likely to become more important mining



In 1939, gold, copper, and nickel accounted for the major portion of the mineral output of Canada. Yet the country produced a great variety of other minerals.

centers than at present. At the same time, the Prairie Provinces, the St. Lawrence Lowlands, and Nova Scotia contain nonmetal minerals such as coal, petroleum, salt, natural gas, and stone. Taking the country as a whole, Canada is rich in a great variety of minerals, and mining is already one of the most important industries of the nation.

Gold. The annual output of gold exceeds in value that of any other mineral. In fact, in 1935, gold at \$35.19 an ounce represented more than one-third of the value of the combined mineral products of the Dominion.

Klondike and the gold diggers The Klondike Region is the most famous, but no longer the most productive, of the Canadian gold fields. The Klondike gold rush brought thousands of gold-diggers into Yukon, and mining towns sprang into existence almost overnight. The mining equipment of each of these gold-diggers consisted of a pan and a shovel. The miner would take a pan of gravel, sand, and dirt in which gold was found, mix it with water, and then shake the pan. The gold, being heavy, would settle to the bottom, making it possible to pour off the gravel, sand, and dirt, and at the same time retain the gold in the pan. This process was called "panning" gold.

The men who panned the gold worked only the rich spots. Moreover they could pan only the surface materials, for even during the warmest summer days the ground thaws only a few feet deep. Everywhere in this northland there is ice just a few feet under the surface that has not thawed in thousands of years. Moreover, gold could not be panned during the long, cold winters. Thus in the

early days, as soon as the cream had been skimmed from the rich surface deposits, the individual miners gave up their claims and returned to their homes. With no better equipment than pans and shovels, they could not profitably work lean ores.

Hydraulic mining and dredging After the gold-diggers with their pans and shovels abandoned Klondike, corporations with large-scale machinery came in. With their modern equipment, they can thaw the frozen ground with water and steam. They can also wash the materials by the hundreds of tons instead of by the panfuls. By the aid of great hydraulic pumps they are able to throw streams of water as thick as a man's body against a mountainside, with such force that tons of dirt, gravel, and rock are washed away within a few minutes. With such machinery, the corporations can quickly wash the gold from millions of tons of sand, gravel, mud, and rock. Under such conditions, mining may be profitable in materials that contain less than one ounce of gold per ton.

Mother-lode mining. At present most of the gold output of Canada is produced from solid rock called *mother lode*. At Porcupine, the richest gold camp in Canada, the gold is found under such conditions. The same is true of the Kirkland Lake District, which almost equals the Porcupine District in gold production. Some of the mine shafts in these areas go down more than 2,000 feet. Many miles of tunnels radiate from these shafts at various depths. From these tunnels the gold ore (solid rock) is brought to the surface.

After the ore is mined, much work remains to be done before the gold is obtained. First the rock must be finely pulverized. The huge machinery used in crushing and grinding the rock is driven by hydroelectric power developed at neighboring waterfalls. After the rock is pulverized, it is placed in a tank containing chemicals that dissolve the gold and cause it to settle to the bottom of the container. After a considerable quantity of this precious metal has been precipitated, it is removed from the tank and refined. It is then ready for the market. In spite of the great amount of work involved, this process of mining has been perfected to such a point that it is now profitable to mine ore which contains less than an ounce of gold per ton of rock.

It requires many laborers to carry on the work. Mines must be dug, machinery must be brought in, power has to be developed, homes built, and supplies provided for the laborers. Consequently, in gold-mining centers, cities quickly spring up in areas that would otherwise remain a wilderness indefinitely.

Silver production of Cobalt and of Gowganda. Most of the silver output of the world is produced as a by-product. That is, the major product of the mine is copper, lead, or zinc, and the production of silver is simply incidental to the securing of these other metals. Cobalt and Gowganda—both situated in Ontario—are, however, real silver-mining districts. For a long period of time Cobalt was the greatest silver mine in the world and turned out more than a ton of pure silver every day. The record production of the Cobalt silver camp was reached in 1911, when 31,000,000 fine ounces of silver were produced. This is equivalent to more than three tons of silver bullion for each working-day in the year.

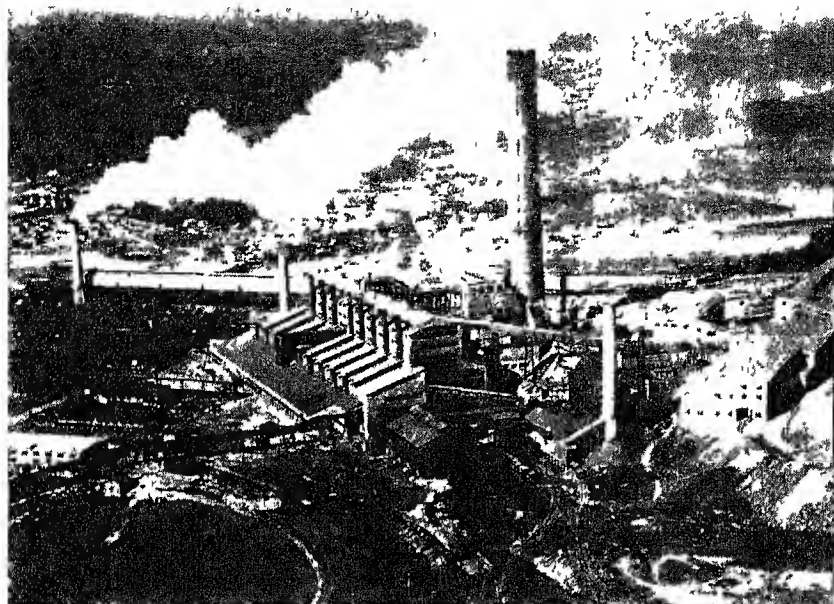
British Columbia now surpasses Ontario in the production of silver. Most of the silver output of Columbia is not produced from silver mines, but is obtained as a by-product from gold, copper, lead, or zinc mines. Some of these mining centers are located in rugged, desolate mountain regions that would remain without population except for the development of the mining industry.

Copper production. Canada is now one of the four great copper producers of the world, and its output has been increasing rapidly. More than half of the copper output of the Dominion is produced in the Sudbury District in Ontario. This mining region is more famous for its nickel than for its copper; yet it is one of the largest copper-producing centers in the world.

Many other deposits of copper have been discovered in Canada, but most of them are poorly located with respect to transportation facilities and have not been developed. Near Flin-Flon large copper and zinc deposits were discovered close to the Hudson Bay Railway. At Rouyn, Quebec, vast deposits of rich copper ore were discovered, but their location in the wilderness made development expensive, and for several years the output was negligible. Later, railroads were constructed to the mines, and hydroelectric plants were installed to develop power for operating the mining machinery and for smelting the ore. These developments made exploitation of the ores profitable, and today Rouyn is one of the major copper-mining districts of Canada.

Nickel. Perhaps the most famous mines of Canada are those of Sudbury. The known nickel reserves of this region are the largest in the world. In 1936, the Sudbury mines produced more than three-fourths of all the nickel mined in the world.

Nickel is needed for many purposes, but its most extensive use is in the manufacture of nickel-steel. When nickel is added to steel



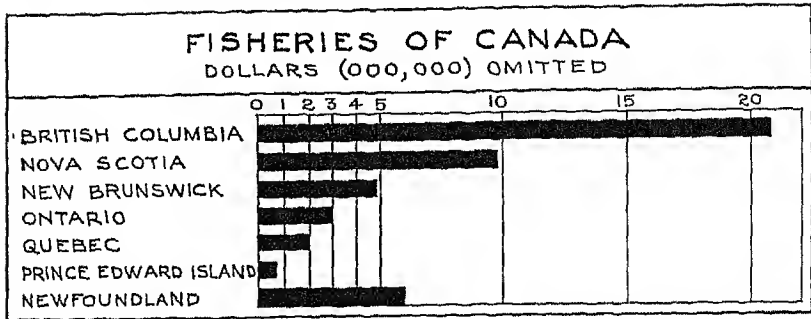
The plant of the International Nickel Company in Ontario is situated in an area that would be little better than a wilderness but for its mineral resources (Courtesy Bureau of Mines, Canada)

the product is exceedingly tough and resistant to shocks. Such steel is used for many purposes, but it is especially demanded for the construction of battleships.

The Sudbury mines enjoyed a period of great prosperity during the World War, especially during the years 1916 to 1918. A period of depression followed, when the building of battleships dropped off sharply. During the last few years, especially since 1935, the state of unrest in the world has once more resulted in a race among the most powerful nations for naval supremacy. Consequently, the demand for nickel has increased rapidly.

THE FISHING INDUSTRY

The fishing industry is important in all of the oceans bordering the country and in the inland rivers and lakes. To the Eskimo, the fisheries of the Arctic Ocean mean life itself. The seal and other fish of these ice-filled waters supply food, clothing, bedding, and at times shelter to the inhabitants of this bleak land. The fishing industry of this region is, however, of little commercial value.



Because of the importance of the salmon industries of western Canada, British Columbia ranks first among the Canadian Provinces in the value of the annual catch of fish. Data for 1940

The largest and most important branch of the commercial fishing industry of Canada is the salmon industry of British Columbia. The lobster and cod fisheries rank second and third respectively. In the inland waters the whitefish is the most important variety caught.

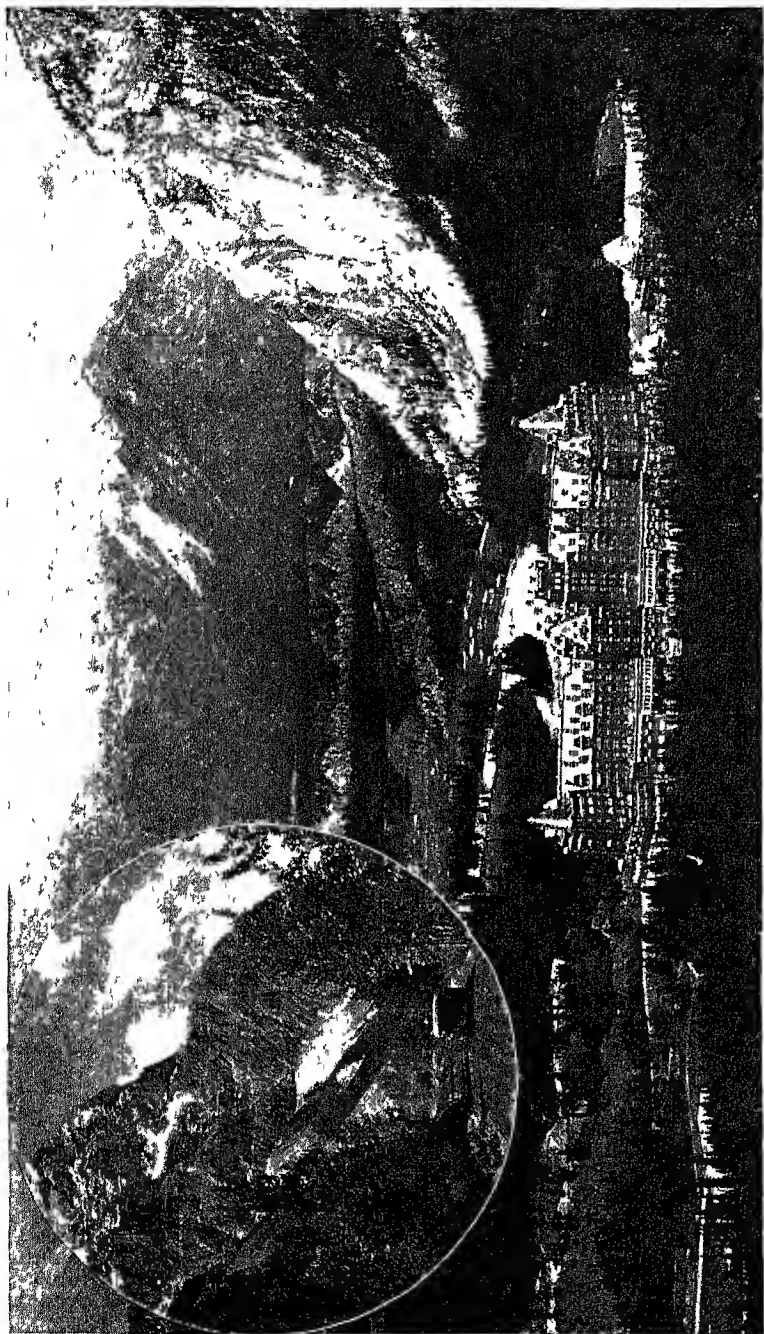
Salmon fisheries Salmon fisheries are of outstanding commercial importance in Canada, and they account for much of the prosperity of



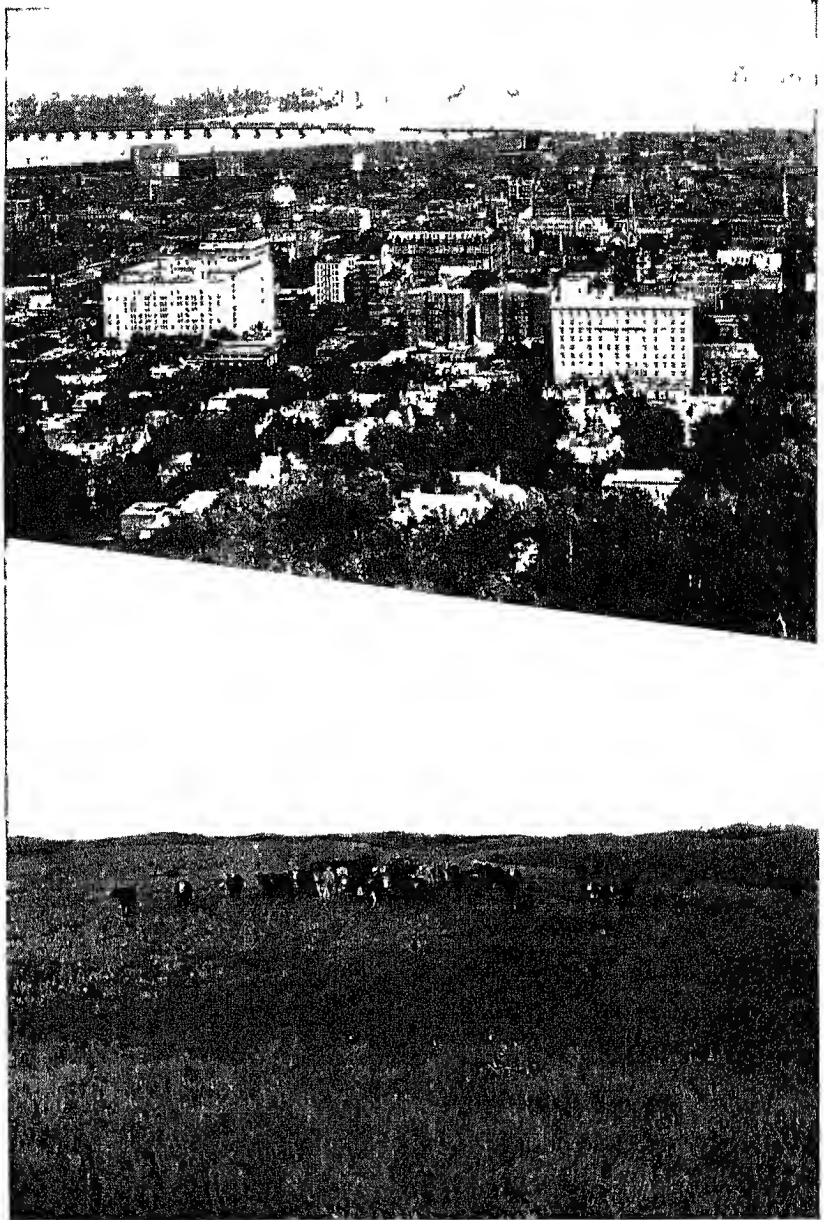
Salmon arriving at the cannery in British Columbia (Courtesy Canadian Govt. Motion Picture Bureau)

British Columbia among the provinces of that nation. Salmon spend most of their lives in the ocean, but swim upstream to inland lakes during the spawning season. On the way upstream they are caught in nets and sent to the canneries, where they are prepared for the world markets. No other fish is canned in such large quantities.

Atlantic fisheries. The Grand Banks off Newfoundland and the smaller banks off Nova Scotia constitute one of the world's greatest fishing grounds. In these waters codfish are



The mountainous area of British Columbia attracts many tourists. Here are found beautiful scenery, pleasant summer climate, good fishing streams, and fine hotels. Excellent railroads and good highways (*circle*) lead to this vacationland. (Courtesy Canadian Pacific Railway)



Above, an urban area in eastern Canada—view of a section of Montreal. This landscape suggests a great population density. Below, the semiarid ranch country of western Canada. In this region farms and ranches are often miles apart. The population density is accordingly very low. (Courtesy Dept. of Immigration and Colonization, Canada.)

more abundant than anywhere else in the world. Fishing is an important industry of Nova Scotia and New Brunswick, and it is the leading industry of Newfoundland and Labrador (Newfoundland and Labrador are not part of Canada). Fishing in the waters of the North Atlantic is a dangerous occupation. Icebergs, fogs, sleet, snow, and wind take a heavy toll of life each year.

THE TOURIST INDUSTRY

Canada is becoming more and more a mecca for summer tourists. The rugged mountain region of British Columbia contains numerous places where the scenery is unsurpassed in grandeur and beauty. Many of the swift mountain streams of this region are well stocked with trout that attract fishermen from many parts of North America. Good highways and railroads have been constructed into the heart of the mountain area, so that the tourist can reach the scenic areas with ease.

Eastern Canada, with its forests, lakes, and rugged beauty, also attracts many thousand tourists each year. The great forest and lake region is the paradise for thousands who enjoy fishing and hunting. Fortunately the tourist centers of eastern Canada lie close to the populous portion of the continent and are more favorably located than British Columbia for the development of this profitable tourist industry.

QUESTIONS AND EXERCISES

1. How does the amount of agricultural land possessed by Canada compare with that possessed by European countries? Use *Statesman's Year Book*.
2. Compare and contrast the nature of the agriculture of the Prairie Provinces with that of the St. Lawrence Lowlands.
3. Why is the agriculture of the Prairie Provinces extensive agriculture, while that of the St. Lawrence Lowlands is intensive agriculture?
4. Where are the major fruit-growing areas of Canada? What factors favor each of these areas?
5. What section of Canada affords the greatest opportunity for expansion of agriculture? Why?
6. What are the major problems of the Canadian ranchers?
7. What major changes are taking place in the utilization of the prairie lands of Canada?

- 8 What parts of Canada are rich in metals? Why?
9. What influences do the mining industries have upon social conditions in Canada?
- 10 Write a 400-word composition on the subject: The Salmon Industries of Canada
- 11 Is the tourist industry of Canada likely to become more important or less important than at present? Why?
- 12 What are the major problems of the Canadian wheat farmer?
- 13 What factors have promoted the rapid expansion of wheat culture in Canada during the last three decades?

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Part III

EUROPE

Modern civilization essentially European. One of the most outstanding facts of world history during the last 400 years has been the spread of European culture and European leadership. Although Europe ranks only fifth among the continents in size, its civilization has profoundly influenced all parts of the world. It has surpassed all other major land areas in accomplishment. In the fields of art, music, and literature Europe has no equal. It has produced leaders in agriculture, manufacturing, mining, printing, and fishing. In the great field of science, Europe has had but one serious competitor, and that is the United States. Most of the people of the United States are European in blood and culture, however. The peoples of Canada, Australia, and New Zealand also trace back to European ancestry. Even the masses of people in Latin America lay claim to European origin, although such claim cannot always be fully acknowledged because of the mixed races which tend to predominate in that part of the New World. In most of Latin America, however, the leaders are Europeans or descendants of Europeans.

Development of European civilization. European civilization had its beginnings in the Mediterranean Basin. In this southern part of the continent the mild winters greatly simplified the problems of making a living. Although the summers were dry, the winter rains made possible extensive pastures and the growth of many different kinds of crops. In fact, a number of important domesticated plants, such as wheat, barley, the olive, and the grape originated in the Mediterranean Region. Most of the other crops had their origin in other parts of Europe, Asia or Africa, and were brought to the Mediterranean lands during the early period of their development. In addition, the quiet waters and limited distances of the Mediterranean Sea favored the early development of navigation, the numerous islands and peninsulas acting as gudepots. The Mediterranean also facilitated contacts with the adjacent continents of Asia and Africa. Still other contacts were established by means of the Red Sea and the lowlands of Mesopotamia and Egypt. Thus Mediterranean Europe had access to the civilizations of southern and eastern

Asia as well as northern Africa. As peaceful contacts with other important areas were early made, the mountains and dense forests to the north and the deserts to the east and south provided partial protection from invasion. Yet, although European civilization started in the Mediterranean Basin, it reached an even higher point of development in the countries to the north and west.

With the development of the New World and the North Atlantic Trade Route, Mediterranean Europe lost its supreme power in commerce. West-European countries, such as the Netherlands and the British Isles, gradually increased their trade with foreign lands. In addition, countries of western Europe possess more important and abundant natural resources for modern industry than one will find in the Mediterranean Basin. Leading manufacturing centers therefore developed in western Europe during and after the Industrial Revolution. Such development was also favored because of the stimulating climate and favorable location. Thus, after the Industrial Revolution, western (rather than southern) Europe had become the chief area of our modern industrial civilization.

Spread of European civilization The spread of European peoples and ideas into other countries was especially marked after the voyages of Columbus. North and South America came under the control of European powers. Dutch, British, French and Portuguese trading posts were established in Asia and Africa. Later these trading posts grew into colonies. Most of Africa and large parts of Asia are today under the control of European nations. This spread of European dominance was extended even into the remote lands of Australia and New Zealand, where the British established a number of colonies. The explorer, missionary, trader, and colonist each played an important role in spreading European civilization into all parts of the world. The Industrial Revolution made Europe powerful, therefore that continent became the important center of social, political, and economic life.

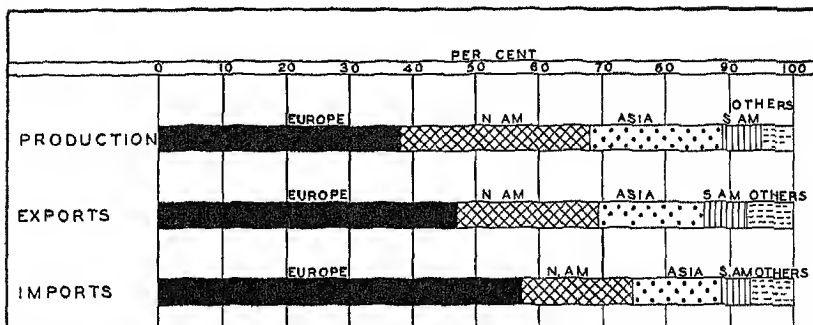
Political dominance of Europe. The fact that five of the seven great powers of the world are European countries is sufficient proof of the political dominance of Europe. The British alone have developed an empire which contains approximately one fourth of the world's population and area. Of the various parts of this largest of all empires, India and Canada have especially important foreign trade relations with Great Britain. Similarly, France developed a colonial empire which is second only to that of Great Britain. The total area

of the French colonies is approximately 18 times as large as the mother country. Yet the colonial population is only a little more than a third larger than that of France. The most valuable of the French possessions are Tunisia, Algeria, Morocco, and French Indo-China. Approximately nine-tenths of the total colonial empire is located in Africa. Unfortunately large parts of the French possessions in Africa are handicapped because of unfavorable climate.

Of the three remaining great powers of Europe (Russia, Italy, and Germany), only Russia has acquired very extensive areas of land beyond the European borders. Russia expanded eastward through the entire northern part of Asia until she finally reached the Pacific. At the present time, Russia controls more land in Asia than she does in Europe. The European and Asiatic parts of Russia comprise the largest compact mass of land under the control of one government. Unlike the compact Russian area, the colonial possessions of Italy are scattered. They are located chiefly in Africa. Germany lost her colonies as a result of the World War, yet German political power is keenly felt throughout the commercial world.

Importance of Europe in agricultural production. With a total cultivated area that is surpassed only by that of Asia, the continent of Europe is a major producer of crops and livestock products. Taken together they are more valuable (total value) than the agricultural products of any other continent. Europe produces more than four-fifths of the world's total output of rye, potatoes, sugar beets, flax fiber, olive oil, and grapes. It produces more than one-half of the world's oats, barley, and milk, and almost one-half of the world's wheat. It contains approximately one-third of the swine and one-half of the total number of horses in the world. Europe has supplied the world with most of the fine breeds of cattle, horses, and sheep. If one studies the cattle, he finds that many of the best-known breeds, such as Holstein, Jersey, and Guernsey, are named after some places in Europe. The above illustrations are sufficient evidence of Europe's contributions to the world's agriculture. More detailed studies of the agricultural production and agricultural problems will be given in following chapters.

By reason of her large total population (about 550,000,000), Europe consumes the larger part of her total output of agricultural products. In fact, the densely populated industrialized nations of western Europe depend also upon other continents for foodstuffs consumed by the millions of urban workers. Yet the commercial



Importance of the continents in total production of economic goods, and in the export and import of trade of the world. The leading position of Europe is noteworthy.

agriculture of European countries should not be overlooked. Eastern Europe produces an excess of grain, whereas southern Europe produces a surplus of citrus fruits, grapes, and olive oil. In some parts of western and northern Europe, such as the Netherlands and Denmark, specialization in dairying has made possible a surplus production of dairy products.

Importance of Europe in manufacturing. Europe holds first rank among the continents in total output of manufacturing as well as agriculture. It produces more than the rest of the world a variety of manufactured products, such as pig iron, aluminum, ships, rayon, synthetic dye, sulphuric acid, and phosphate fertilizers. It accounts for nearly half of the world's output of wood pulp. It is also a major contributor in the production of cotton, woolen, and linen textiles. It is surpassed only by North America in the manufacture of machines and automobiles.

Commercial importance of Europe. Europe holds first rank in world commerce as well as in the total output (in value) of economic goods (illus. above). It surpasses all other continents in consumption of economic products, and its import trade exceeds that of all the rest of the world. In exports, also, Europe holds first rank among the continents. In short, approximately 50 per cent of the foreign trade of the world is conducted through European countries. Foremost among these countries are the British Isles, Germany, and France. These are three of the four leading countries in world trade, and make up the most important part of the European hub of commerce. The other hub of the commercial world is eastern United States.

Importance of Europe to the United States. The people of the United States have closer cultural, political, and economic ties with Europe than with any other continent. European culture was transplanted into the United States, where it formed the foundation for our cultural development. Since Europe contains most of the Great Powers, and European countries own land on all of the continents, our relations with Europe are also important from a political point of view. But the economic relations of the United States with European countries appear to be the more important in affecting our everyday industrial and commercial activities. Europe has long been the chief market for American exports and the chief source of merchandise imported into our country. American capitalists have loaned huge sums of money to European countries. In addition, ships owned by European nations are engaged in carrying a large part of the overseas trade of our country. All of these factors suggest that it is not only interesting but also important for the business people of the United States to have a sound knowledge of European conditions. In fact, it is impossible to understand some of the important problems of our own country without a knowledge of Europe and European affairs. Hence a study of Europe becomes significant to all of us.

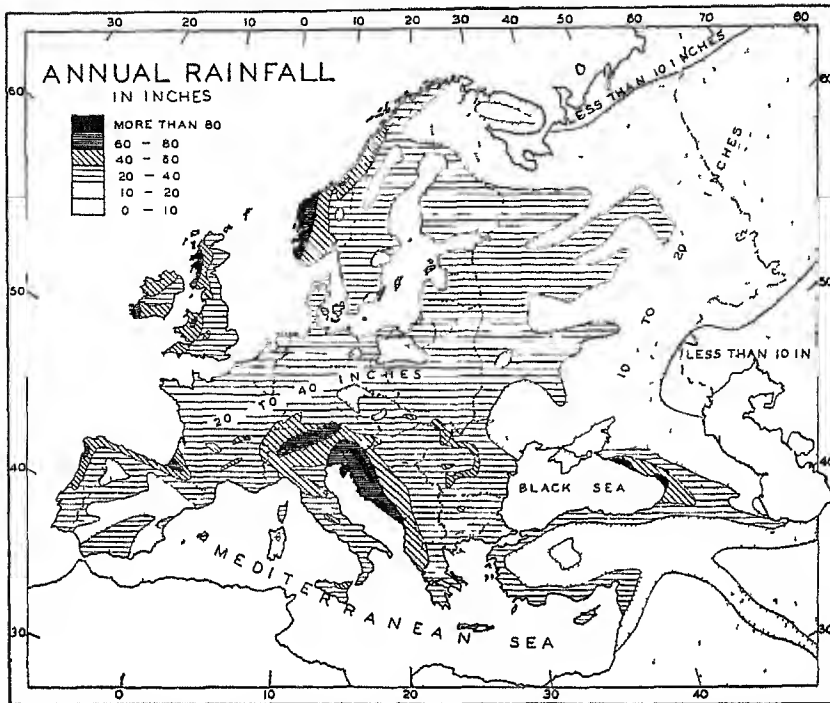
REASONS FOR THE IMPORTANCE OF EUROPE

Variety of factors to consider. It is but logical that we should raise the question: Why has Europe become so important culturally, politically, and economically? No single factor will answer this question. In fact, many forces have operated in the development of that continent. Some of the reasons for Europe's dominance may be found in the natural environment; others pertain to the historic and human elements. The factors of the natural environment, such as location, relief, climate, and natural resources are fundamental. These have in large measure affected the course of development historically as well as the people themselves. For example, how could the Industrial Revolution have taken place in western Europe without the presence of natural resources, such as coal and iron? Moreover, the human element is affected by the climate. Climate may be enervating and thus retard human progress, or it may be invigorating and thereby favor a high development of human energy, such as one finds in western Europe.

Excellent location and irregular shape. That location and shape have been important environmental factors in aiding Europe's development cannot be denied. Her central position amid the great land masses of the world has made possible contacts with other lands and people. It has facilitated the exchange of ideas and goods. The greater part of the continent is located in the middle latitudes, and contains but little land that is unproductive because of unfavorable climate. Moreover, study the map of Europe, and note its extremely irregular shape. Large embayments and seas extend far inland. These waters have a moderating influence upon the temperature of the adjacent land and make possible cheap transportation. This advantage was of special importance to Europe before the days of the railroad. The irregular, broken coast contains numerous excellent harbors, many of which have become important ports.

A favorable relief. Europe contains a diverse relief, although it also has a large proportion of lowland. The percentage of lowland is greater than in any other continent of the world. The lowland of Europe is most extensive in the eastern, Russian part of the continent. A level lowland favors the development of transportation, agriculture, and commerce. Even the highlands of Europe are no serious handicap. Nowhere does the continent contain a barrier comparable to the Himalayas of Asia or the Andes Mountains of South America. The Alps, fortunately, are crossed by several low passes which have facilitated the building of railroads and highways for transmountain traffic. Moreover, most of Europe's mountains extend in an east-to-west direction and therefore permit the westerly winds to carry moisture and the tempering effect of the ocean far inland.

An invigorating climate. Relatively little land in Europe is rendered unproductive because of adverse climate. It surpasses all continents in the percentage of total area that is climatically suitable for human development. Only in the north, southeast, and in some of the higher mountains and plateaus will one find decidedly unfavorable climatic conditions. A narrow belt of tundra in the north and a small area of desert in the southeast (just to the north of the Caspian Sea) are unproductive because of their climate. (Map opposite.) There is no enervating humid tropical climate in Europe and very little desert. On the other hand, the climate of a large part of Europe, mainly western Europe, is especially stimulating to human health and energy. Moreover, the rainfall in most parts of Europe

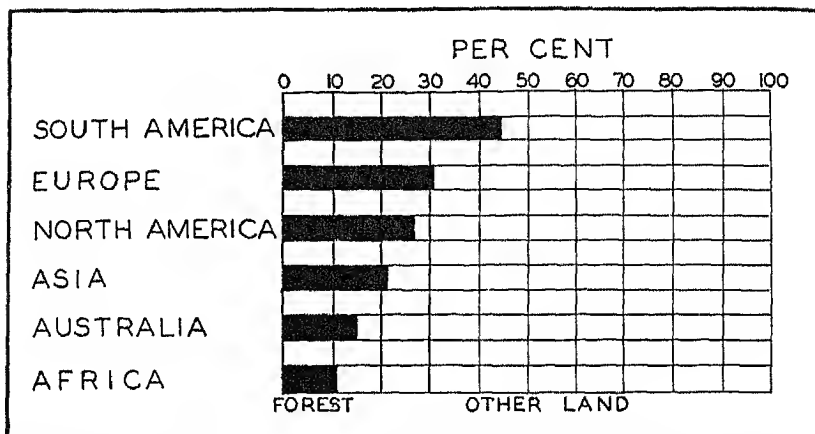


Average annual precipitation of Europe The greater part of western Europe has an average annual precipitation of 20 to 40 inches, whereas eastern Europe gets only 10 to 20 inches annually. Desert areas are comparatively small, while the areas of heavy rainfall are located along, or near, the western coasts of the continent

is plentiful and well distributed, and crops may be produced without the aid of irrigation. Irrigation is necessary, however, in parts of southern Europe, because of the extremely dry summers. In general, therefore, the climate of Europe exerts a beneficent effect upon mankind's physical and mental well-being as well as the plant and animal life of the continent.

Varied resources of Europe. Europe's prominence in industry and commerce is due in large measure to the variety and abundance of her natural resources. She has many different kinds of soils, large forests in the north, important waterways, and great mineral wealth.

Utilizing Europe's soils. The most important use of soils is for the growth of crops. In Europe more than half of the total land is

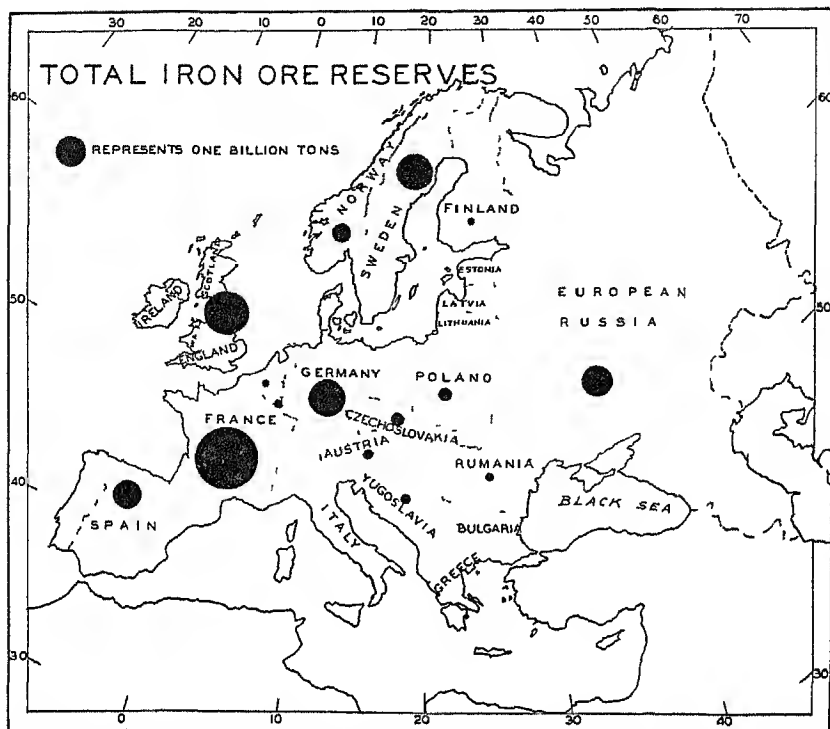


The ratio of forests to total area in the continents of the world. It is significant that Europe is surpassed only by South America in the percentage of forest land

devoted to the production of crops. In fact, Europe has a larger proportion of its total area in crops than has any other continent. Although some of Europe's soils are very fertile, even a few of the poor soil areas have been brought under cultivation. For example, large sandy, infertile areas in northern Germany and in Denmark have been made productive through the scientific fertilization and cultivation of crops. Moreover, the variations of climate and relief have given a great variety of soils. These have made possible varied types of agricultural development.

Large forest resources. Originally most of Europe was covered with forests. But vast stretches of virgin forest have been removed as agriculture expanded. Yet even today Europe is surpassed only by South America in the proportion of its area that is forested. The largest of the remaining forests of Europe are located in northern Russia, the Baltic lands, and Scandinavia.

The abundant forest resources of Norway, Finland, and Russia have enabled these countries to become important exporters of timber products. Finland and Sweden, together, supply Europe with more than 50 per cent of her lumber requirements. In addition, large quantities of pulpwood are exported from these northern lands. On the other hand, the countries of western and southern Europe must supplement their local production with imported lumber and pulpwood. Of these areas, southern Europe is most poorly endowed with timber because of the long occupancy and therefore depletion of



Chief iron ore reserves of Europe. Circles drawn with respect to relative size of reserves. The largest reserve—that is, the iron ore reserve of France—is estimated at approximately 43 billion metric tons.

original reserves, and the extremely dry summers which greatly retard tree growth.

Utilization of waterways. No continent shows a more complete utilization of waterways than does Europe. Rivers such as the Rhine, Elbe, Oder, and Weser have become important arteries of commerce. In various parts of the continent canals have been dug in order to facilitate transportation by water. The development of waterways has been associated with a marked growth in Europe's industry and commerce.

Great mineral wealth. The industrial life of Europe is benefited by the existence of an abundance and variety of essential minerals. It is a well-established fact of mineral distribution that the most important mineral-containing regions border the North Atlantic. The two major regions are eastern United States and western Europe. Europe is well supplied with basic minerals, such as coal

and iron ore. Although North America and Asia surpass Europe in coal reserves, no continent exceeds her in production. Europe also contains large iron ore reserves, especially in France, Sweden, the United Kingdom, Spain, Germany, and Russia. (Illus., p. 353) The continent also mines large quantities of zinc, copper, and lead. Europe leads the world in the production of potash, manganese, and bauxite. Even in the production of petroleum Europe is noteworthy, being second only to North America. But most of Europe's petroleum is found in the southeast, that is, chiefly in Russia and Rumania, rather than in the industrialized western part of the continent. In short, Europe contains a favorable combination of minerals essential to the development of modern industry.

Water power. Europe is also well endowed with water-power resources. Although statistics show that she is surpassed by Africa, Asia, and North America, she is outranked only by Africa in the proportion of potential water power to total area. Moreover, Europe ranks second only to North America in the utilization of water power. It is also a fortunate circumstance in Europe that the water power is most abundant in many of the areas in which coal and other types of fuel are lacking. Thus abundant water-power resources are found in Scandinavia, the Alps, and the Caucasus, whereas these areas have practically no coal.

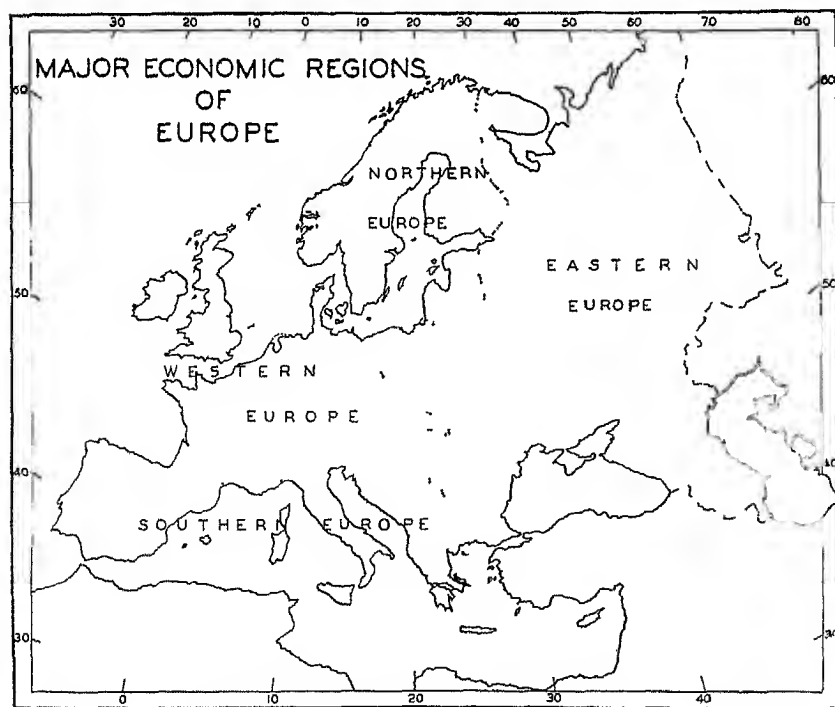
The people. No continent could have attained the place of leadership that Europe now holds without progressive inhabitants. That Europe contains several different races of people is an advantage. In a large part of northern and western Europe the Nordics constitute the chief racial type. These tall, fair-haired, and fair-skinned people are known for their ambition, they delight in achievement, energy, and inventiveness. Many men of genius have come from this racial stock. The brunet Mediterranean race of southern Europe has also been a major factor in the development of the continent. The stockier, brown-eyed Alpine race is distributed chiefly in the highlands and adjacent lowlands of west-central Europe. Eastern Europe is the land of the Slav. All of these racial stocks have made major contributions to Europe's advance in religion, business, science, literature, art, politics, and philosophy. But we must not overlook the fact that the mental and bodily vigor of Europe's people has not developed just by accident. We would not look for such traits among the inhabitants of the humid rain forests of the Amazon or the Congo Basins. Europe (especially western Europe) has a climate that exercises a beneficial effect on man. Moreover, as we have already

seen, the continent contains an abundance and variety of those raw materials which are basic to our modern civilization. The people, therefore, had the necessary materials and tools with which to work.

The time factor. It has taken a long time for Europe to reach its present stage of economic, political, and social development. New ideas have been added to the old. The people have constantly built upon the accumulated knowledge of the past. In short, we must not overlook the importance of the historical factor. Yet the trend of great accomplishment which characterized the Industrial Revolution could not have been realized if Europe had lacked basic raw materials, especially coal and iron ore.

GEOGRAPHIC DIVISIONS OF EUROPE

Four major divisions. The achievements of European peoples have not been uniformly distributed over the continent, nor have the various parts of Europe made equal progress in industry and commerce. Thus the various countries of Europe may be grouped



Major geographical divisions of Europe

together into major geographic divisions. Such grouping will facilitate our study of Europe's industries and commerce, and in many cases will do away with needless repetition. Moreover, it is not possible to treat all countries within the page limits of this text. We shall therefore concentrate attention on the countries and regions that will give us an understanding of the commercial world. With these facts in mind, we shall therefore consider the industries, commerce, and major economic problems of northern, western, southern, and eastern Europe.

QUESTIONS AND EXERCISES

1. Why is our modern civilization sometimes referred to as a European one?
2. What favored the early development of European civilization in the Mediterranean Basin?
3. What made it possible for European civilization to reach higher points of development in western Europe than in the Mediterranean Basin?
4. In what ways has Europe contributed to the agriculture of the world?
5. What is the importance of Europe in manufacturing and commerce?
6. For what reasons are the people of the United States interested in Europe? List as many reasons as you can.
7. In what ways have the climate and relief of Europe favored the economic development of the continent?
8. Where are the largest forests of Europe located? In what part of Europe is timber consumption the greatest? To what extent is Europe supplied with timber?
9. What part have minerals played in the development of Europe?
10. Name the major racial groups of Europe. Has it been an advantage to have several races rather than one?

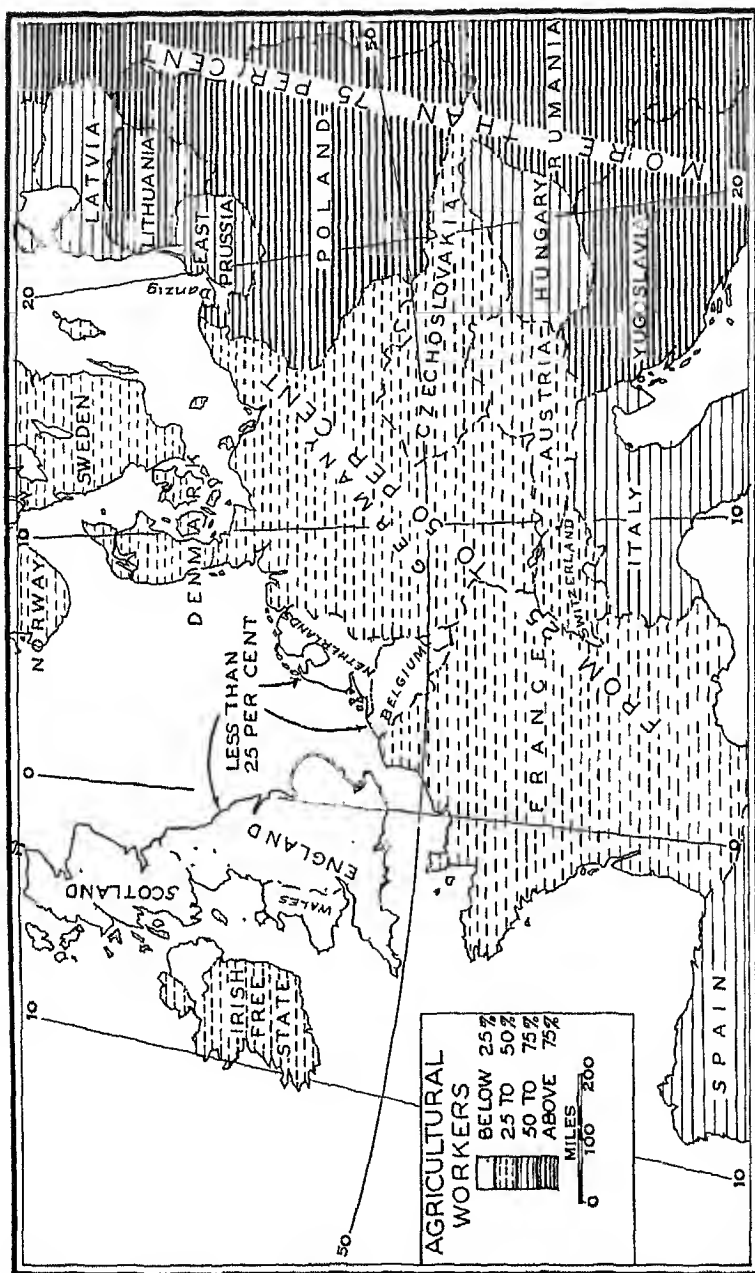
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WESTERN EUROPE— THE AGRICULTURAL INDUSTRY

Feeding a large population. Most important of all problems pertaining to the agriculture of western Europe is that which centers about the production of foodstuffs for the millions of people who inhabit this region. In general, industry and commerce have attracted the greatest number of workers, and in some countries only a small percentage of the people are engaged in agriculture. The map on the next page will show you that the percentage of agricultural workers in Europe increases from west to east. Western Europe is mainly industrial, whereas eastern Europe is agricultural. The agricultural east helps feed the industrial west. Yet western Europe obtains many agricultural products from other continents, and also grows surprisingly large amounts of foodstuffs at home. Western Europe produces nearly enough dairy products, tubers, and other vegetables to satisfy home requirements. In this region of cool, moist summers, much land is given to hay and pasture, and the raising of livestock has become a main activity. Cereals consist chiefly of oats, rye, and barley in the northern part of the region, whereas wheat increases in importance with distance southward. Thus France, located in the southern part of this area, has more land in wheat than in any other cereal.

Meeting the demands of industry. Western Europe's great bee-hives of industry draw heavily upon various crude materials, including agricultural products. Although various of the agricultural raw materials, such as cotton, hemp, jute, and raw silk, are obtained mainly from foreign countries, the manufacture of local farm products gives employment to many people. This adds to the industrial life of the region. Thus potatoes are used in the manufacture of starch as well as alcohol, especially in Germany. Flax and wool produced within western Europe provide raw materials for textile industries. Sugar is manufactured from the millions of tons of sugar beets that are grown each year within this area. From their livestock industry, the people of western Europe obtain raw materials for the making of butter, cheese, leather, and many other prod-



In general, there is an increase in the percentage of agricultural workers from west to east in Europe. The chief exception to this rule is the Irish Free State (now known as Ireland), which, as yet, is largely agricultural.

ucts The farmers therefore satisfy in part the requirements of the various industries for agricultural raw materials Many other products are obtained from every part of the commercial world.

Desire of nations to be self-sufficient. One of the most serious of the problems concerning the economic life of western Europe is the desire of some nations to become independent of outside sources of farm products When a nation is attempting to become independent of outside areas, we say that it wishes to become *self-sufficient* No western European nation is self-sufficient in agricultural products today Western Europe as a whole is nearly self-sufficient in some items, such as potatoes and dairy products Some nations are more nearly self-sufficient than others For example, France and Germany both produce more than three-fourths of the food consumed within their borders. On the other hand, under normal conditions the United Kingdom produces enough food to support its population for a period of only six weeks

Germany's tariff protection to agriculture. This difference in degree of self-sufficiency among the nations of western Europe is due mainly to the fact that some of them have attempted to protect their agriculture against foreign competition, and some of them have not During the last half of the nineteenth century, when vast quantities of cheap grain were beginning to flow from the new, fertile lands of America into the grain elevators of Europe, some European countries imposed a high tariff on imported grain in order to protect their farmers The high tariff raised the price and led to the maintenance of grain cultivation Thus Germany favored the protective tariff for her agriculture as well as industry. As the population increased, her agriculture also became more intensive and scientific in character. Partly because of protection, Germany was able to maintain a moderately important output of grain She also developed a noteworthy livestock industry She sought to become as self-sufficient as possible German leaders viewed with alarm the rapid growth of manufacturing and the declining importance of agriculture. They saw grave danger in building the economic future on the basis of a contracting agriculture and an expanding manufacturing industry.

Following periods of warfare, when they had become aware of their dependence upon foreign sources of foodstuffs and industrial raw materials, German leaders strove still harder for the principle

of self-sufficiency in agriculture and in other occupations. But when the prices of agricultural products are maintained on a high level because of the tariff, there is no gain, but rather loss. The inhabitants of the country pay abnormally high prices for the protected goods. Moreover, in spite of high protective tariffs, Germany must import large amounts of food, especially grain. In 1936 the German leader, Adolf Hitler, made it known that Germany was greatly in need of additional grain. The country was ready to import approximately 3,000,000 bushels of grain.

Britain's free trade as related to her agriculture. In contrast to Germany's policy of protection, Great Britain favored the principle of free trade during the 60-year period prior to the World War. In 1846 England abolished the import tariffs on grain, known as the "corn laws," and in 1854 she repealed the last of her navigation acts. The corn laws were made to protect the farmer against the cheap agricultural products of foreign lands; whereas the navigation acts gave special favors to British ships. When these protective measures were abolished, Great Britain became the leading free-trade nation of all history. British leaders realized that the future prosperity of their country lay not in agriculture but in manufacturing. The development of manufacturing was favored by the import of cheap raw materials and foodstuffs from their own colonies and from foreign countries. In exchange for these products, Great Britain offers shipping services, banking services, and a great variety of manufactures.

Increasing the yields per acre. With the rapidly growing population and tremendous industrial development, western Europe devised methods of agriculture that would bring larger returns per acre. Science was applied to agriculture and helped solve many important problems. Scientists studied the chemical composition of various mineral plant foods as these were related to plant growth. They discovered that different plants withdrew different chemical elements from the soil. They therefore proved that the same crop, when grown year after year, will rob the soil of its fertility. Crop rotations—succession of different crops on the same land—will help to maintain fertility. Through scientific research, new and better kinds of fertilizers were discovered. The yields per acre increased remarkably. Today western Europe is one of the leading regions of the world in crop yields to the acre and in yearly income for each farm worker. For example, the Netherlands and Denmark produce

more than 40 bushels of wheat per acre, as compared with 15 in the United States. Belgium and the Netherlands produce on the average more than 250 bushels of potatoes to the acre, as compared with 113 bushels to the acre in the United States.

In view of the above facts it seems that further increases in the total agricultural output of Europe must come chiefly from the addition of new lands rather than from further improvements in agricultural methods. Additional crop lands have been obtained mainly by means of the clearing of forests and the draining of swamps. Densely populated Netherlands is now working on one of the greatest drainage projects of history—the construction of four large polders in an area that was formerly the Zuider Zee.

Size of farms. Western Europe was long troubled because of the fact that comparatively few people owned most of the land. Great estates were held by the nobility, the Church, and the ruling class. These large holdings were worked by great masses of landless peasants. These poor workers often lived in subserviency and suppression. Since they owned no land they took comparatively little interest in it. In the countries of western Europe the nineteenth century marked the period of most widespread subdivision of these large estates. The people put pressure on their respective governments to break up these large holdings, and by the time of the World War most of the farm land was owned by the peasants, and the large estate had become a thing of the past. The one important exception to this condition of peasant ownership of land is Great Britain, where, as we shall see later, a large percentage of the farm land is operated by tenants.

The division of the land may continue to a point where the farms become too small. In short, there may be a serious problem associated with the minute subdivision of the land, just as there was one regarding the large estates and the landless masses of feudal times. Today half of the agricultural holdings of Denmark cover less than 13 acres each, and the majority of the farms of the Netherlands are less than 12 acres in extent. Large labor-saving machines cannot be used satisfactorily on such minute holdings. In short, individual farms may become too small for profitable cultivation, and in many instances they barely support their owners. At the same time that farms have decreased in size, the standard of living of the people has improved. This has made it still more difficult for the agricultural areas

The problem of increasing tenancy. With the rapid increase in industrial life, millions of farm people have been attracted to the cities by the high wages paid to factory workers. Others have found it difficult to keep their farms because of the low prices received for their products and the increasing taxes. Many have therefore sold their farms and moved to the cities. Others have remained on farms as renters or tenants rather than owners. This trend toward tenant farming has been most marked in the British Isles. Let us, therefore, next study some selected countries of western Europe with regard to their agricultural industry, beginning our study with the British Isles.

AGRICULTURE IN GREAT BRITAIN

Population and agriculture. Before the Industrial Revolution most of Britain's people lived in the agricultural areas. At that time the fertile agricultural plain of southeastern England constituted the most densely populated region of the country. But as the small domestic industries gave place to the factory system, millions of people were attracted to the coal-mining districts, the large industrial cities, and the leading commercial centers. Today only 56 per cent of the working population of England and Wales and about 10 per cent of the Scotch workers are engaged in agriculture; whereas more than 40 per cent are employed in manufacturing. The Lancashire cotton district of western England and the commercial area of London are now the most densely populated regions. On the other hand, nearly 70 per cent of the people of the Irish Free State live on farms and in small towns and villages of less than 2,000 inhabitants.

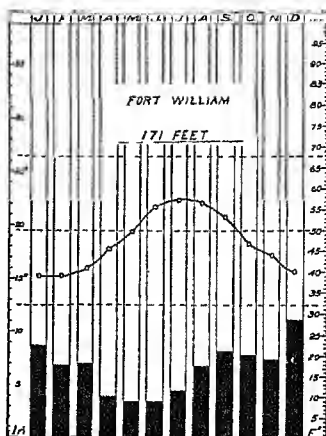
Use of the land. As great numbers of Britain's people moved to the cities to become workers in industry and commerce, much crop land went out of cultivation and was soon covered with native grasses and shrubs. Such areas, therefore, became grazing land, and the areas of crop land decreased while the permanent pastures increased. Other reasons also help account for this decline in the acreage devoted to crops. For example, the free-trade policy of Great Britain favored the import of cheap grains from other parts of the world. Moreover, many other lands have a better climate than that of the British Isles for the production of grains. The greater part of Britain is unsuitable for wheat culture because of the cool, moist summers and the wet harvest seasons. (Top chart, p. 363.)

Most of the great wheat-producing regions of the world have warm summers and comparatively dry harvest periods. The cool, moist summers and the large areas of highland combine to favor pastoral activities and the livestock industry. The lower chart on this page shows that the acreage of permanent pasture now surpasses that of arable land in England, Ireland, and Wales. Although forests at one time covered most of Britain, these have been reduced in size so that they cover but a small part of the present land surface. Thus Britain depends upon other countries for nearly all of the lumber, wood pulp, and newsprint paper that she uses each year.

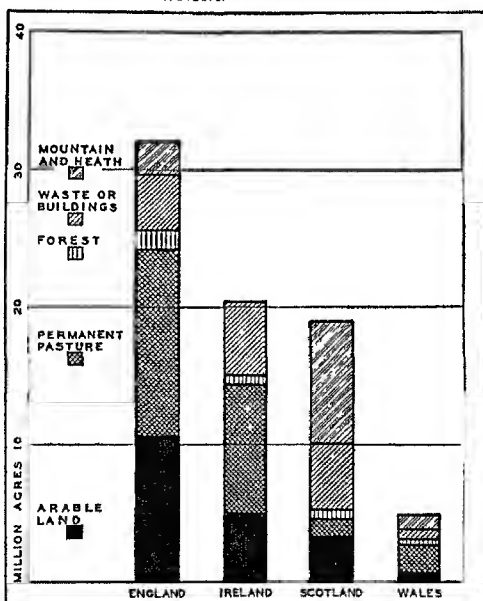
The leading crops. The chart at top of page 364 shows the leading

crops of the United Kingdom. It will be seen that much more land is devoted to hay and oats than to wheat. In fact, the acreage of hay is nearly four times as great as that of wheat.

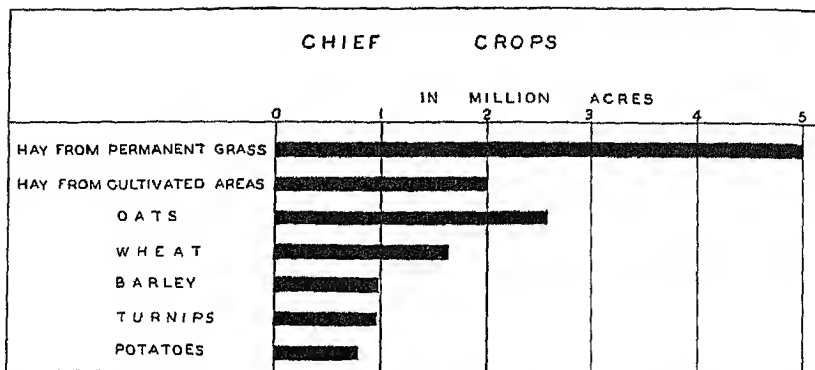
Of all the cereals grown in Britain, the oats crop is most important. It is a cool-season crop—one that thrives well in regions that have cool, moist summers. Oats are therefore especially well adapted to cool Scotland and moist Ireland. Yet they are also grown in other parts of the British Isles. Oats are used as food for people as well as feed for livestock. As a food for human beings the



Average monthly rainfall and temperatures at Fort William, located in western Scotland. Note the wet harvest period—unfavorable for the harvest of various grains, especially wheat.



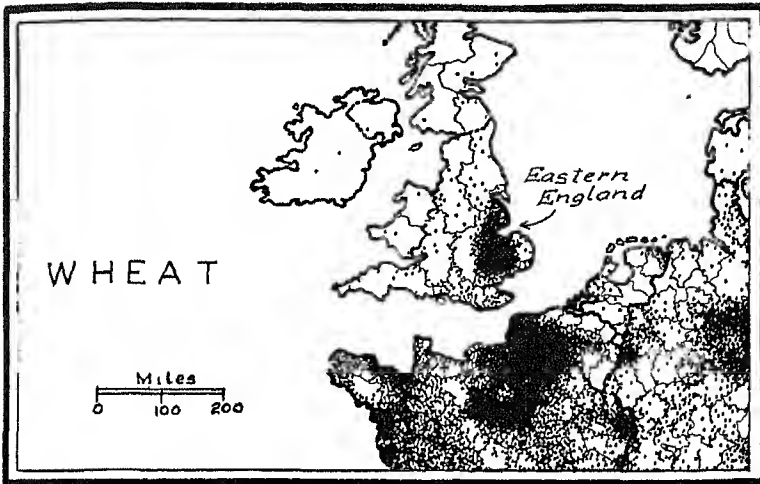
Chief uses of land in England, Ireland, Scotland, and Wales (Adapted from Blanchard and Visher *Economic Geography of Europe*. Courtesy McGraw-Hill Book Company, publishers)



Chief crops of the United Kingdom The place occupied by hay is noteworthy Most of the hay is obtained from permanent (unplowed) grassland Oats, a cool-season crop, ranks first among the grains



Harvest of oats in the Malvern Hills, located about thirty miles southwest of Birmingham, England Oats are the leading grain crop of the British Isles This crop is especially important in the cool, moist western areas (Courtesy Travel and Industrial Development Assn of Great Britain and Ireland.)

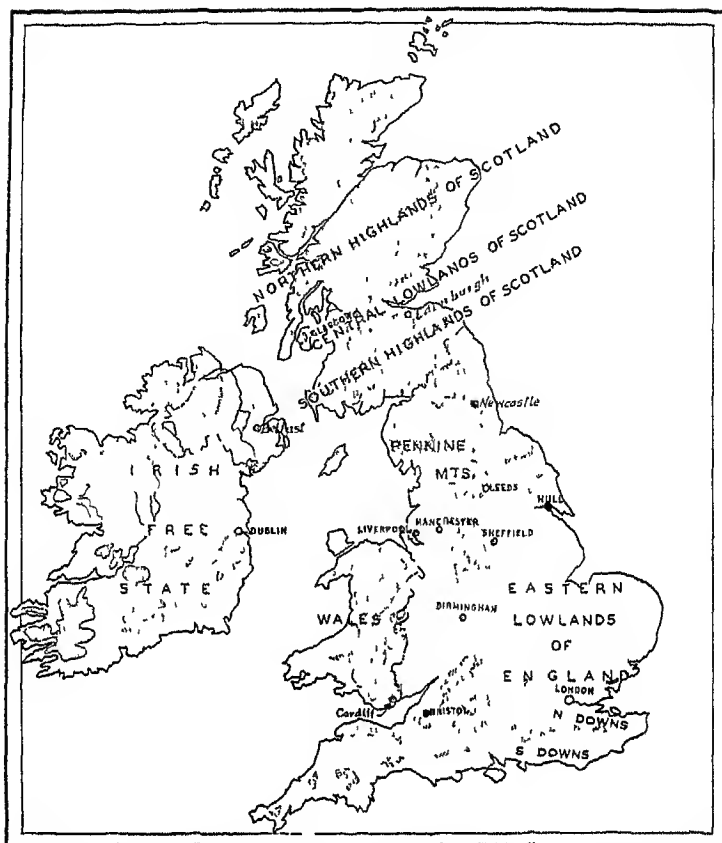


Distribution of wheat in the British Isles and on adjacent areas located on the continental mainland of Europe. Notice the importance of wheat in eastern England, and the small amounts produced in the western areas of the British Isles. Each dot represents 100,000 bushels of wheat. (Adapted from U S Dept of Agriculture map)

crop is relatively more important than wheat in the moist western highlands of the United Kingdom, especially in Scotland. The inhabitant of eastern England who once said, "Oats constitute a food for man in Scotland, but merely feed for our livestock here in England," expresses the difference in crop production between the lowlands of eastern England and the highlands of Scotland.

The wheat lands of eastern England. If you will look at the map at the top of the page you will see that wheat, unlike oats, is grown chiefly in eastern England. Here two areas are noteworthy—the Thames River Basin and a drained lowland located to the north of this basin. Study the map on the next page, and notice that eastern England contains the largest area of lowland in all of the United Kingdom. This is the only part of the country in which the rainfall is less than 25 inches a year. It should be noted that the great wheat lands of the world, such as the major wheat regions of Russia and the Spring Wheat Belt of North America, are comparatively level lands that receive only 15 to 25 inches of rainfall a year.

In eastern England the yields per acre are remarkably high—that is, approximately 32 bushels per acre, as compared with only 15 in the United States. Such high yields per acre are due in large



The British Isles, showing the chief highland and lowland areas. The dotted areas are highlands above an elevation of 1,000 feet. Note the low hills in southeastern England, known as the North and South Downs. The Irish Free State is now officially known as Ireland (Altitude according to J Paul Goode)

part to the fact that the English farmers take great care in selecting the land that is best suited for wheat culture. Here wheat is only one of a number of crops, all of which receive much care and attention from the British farmers. Their wheat must compete with the grain produced on the fertile, cheap lands of the great wheat belts of the world. Although the British farmers have the advantage of nearness to markets, they satisfy the domestic market with only one-fourth of the wheat that is consumed each year.

The livestock industry. Most of the crops produced in the

British Isles are consumed by farm animals. In value the livestock industry is by far the most important source of income for the British farmers. The value of livestock products is nearly three times as great as that of crops.

Several factors have favored the development of the animal industries. The moist, cool marine climate is better suited for the growth of hay and pasture than for cereals. The large stretches of rugged highlands, such as found in Wales, north-central England, and Scotland, are excellent grazing areas. In addition, the rapid growth of the city population has created a large demand for livestock products.

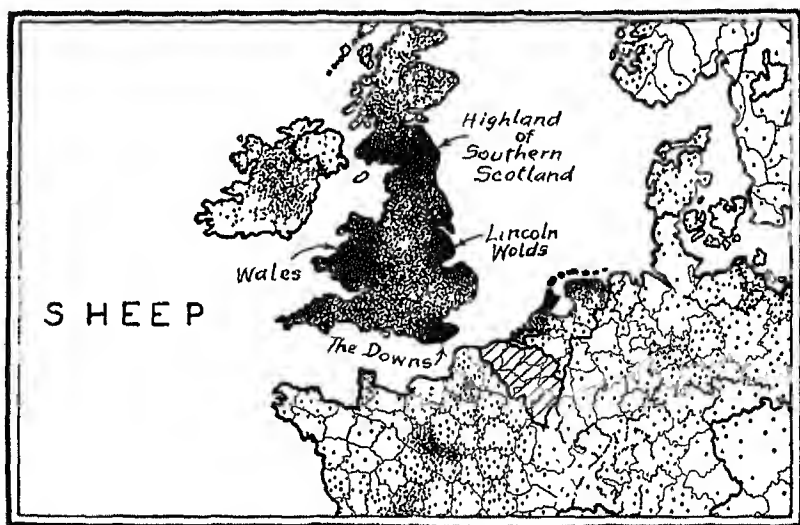
Of all farm animals raised in the British Isles, sheep are most numerous. Great Britain has more than 30 distinct varieties, and the nations of the New World have obtained many different kinds of sheep from this country. No other west-European country has so many sheep per square mile as has the United Kingdom, the density being 265 per square mile, as compared with 45 per square mile in France and only 19 in Germany. This is remarkable in view of the fact that the great sheep lands of the world have a dry climate and comparatively low population densities. One of the factors that accounts for this importance of the sheep industry in the United Kingdom is historic. This industry was afforded protection during periods of warfare on the mainland of Europe. The surrounding seas acted as a barrier to shut out enemies when wars were



Sheep grazing on pastures in Warwick County (Warwickshire). Birmingham is in the northwest corner of Warwick County. The village of Stoneleigh is in the background. (Courtesy Travel and Industrial Development Assn. of Great Britain and Ireland.)

waged on the Continent. It must be remembered that sheep are easily taken during periods of warfare. They may be used for food and for the making of clothing. Moreover, during the 60-year period prior to the World War, Great Britain's foreign trade policy favored free trade, so that cheap foods could be secured for industrial workers. Accordingly, cereals and other foodstuffs were obtained at low prices from the vast agricultural lands of the world, especially from her own dominions and colonies. Cultivated lands that were unable to produce crops in competition with foreign areas became pastures. Thus the crop acreage decreased while grazing lands increased. The sheep industry, which long had supplied the British textile mills with wool, remained as an important part of British agriculture, since the grazing lands could be used to good advantage.

In the sheep distribution map below you will see that sheep raising takes place in all parts of the British Isles, but it is especially important in the soft limestone and chalk hills and ridges of southern and eastern England and in the highlands of Wales and Scotland. Some of the highlands, especially those of southeastern England, are comparatively dry—a condition that is typical of the major sheep-raising regions of the world. As we have already seen, south-



Distribution of sheep. Note the areas of greatest density of sheep in the British Isles. Each dot represents 10,000 sheep. (Adapted from U. S. Dept. of Agriculture map.)

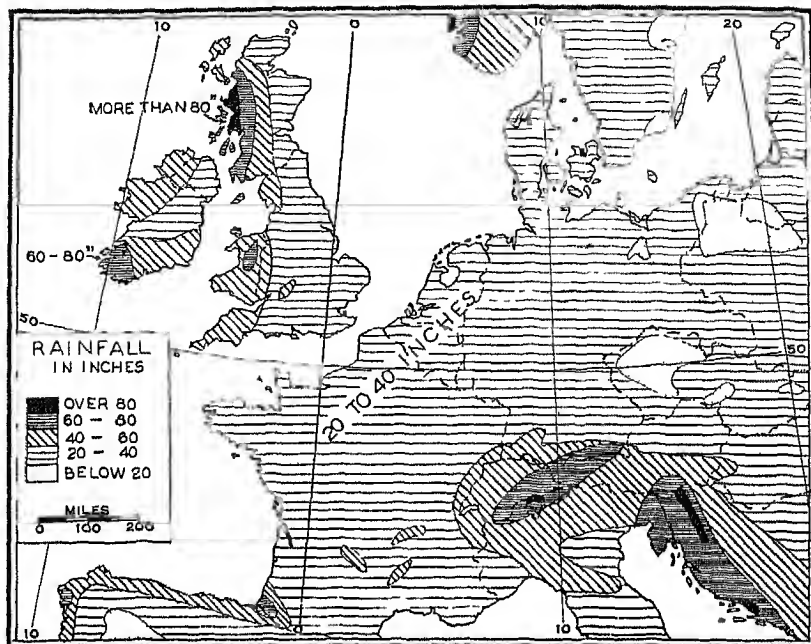
eastern England has the lowest rainfall in the country. Moreover, to the south of the Thames River are some hills and ridges known as the North and South Downs (Map opposite) These highlands are underlaid by chalk, and water drains rapidly through these soft rocks. Here the soils become relatively dry and support but little vegetation. Since sheep are better able than cattle to pick a living on scant pastures, they are several times as numerous as cattle in this area. Their wool is considered to be the finest in the country. On the other hand, the wet highland regions of Scotland and Wales produce the highest grade of mutton.

Agriculture in Ireland. In Ireland agriculture is the most important occupation. Here about 40 per cent of the people are farmers, as compared with 5.6 per cent in England and Wales. Moreover, most of the farms of Ireland are quite small. They average not more than 28 acres each, as compared with 90 acres to a farm in the United Kingdom.

A study of the climate, land surface, and soil of Ireland shows that the country is handicapped with regard to the development of agriculture. In most parts the soil is relatively thin and the rainfall is so heavy that not much grain can be grown. Look at the illustration on page 370 and notice the abundance of rainfall, especially in the western and southern parts of Ireland. Why do these parts receive the greater rainfall? Moreover, most of central Ireland consists of remarkably level and poorly drained land. Much of this central plain has a low, marshy surface, which is rich in peat, but poorly suited for the profitable production of most crops. Surrounding the great central plain are highlands, which are most extensive in the southern and northern parts of the island. These highlands are much better drained than the central plain, yet they have rugged relief, cool summers, and an abundant rainfall. Thus the moist, cool climate of most of Ireland favors pastures and the livestock industry rather than crop production.

Half of Ireland is devoted to permanent grass, whereas cereals and other crops occupy only one-fifth of the total land area. Grass does best in a cool, moist climate. Here one finds a greater percentage of grassland than in any other part of Europe. The mild winters enable grazing practically the year round. The landscape is constantly green, and it is not surprising that Ireland is known as the Emerald Isle.

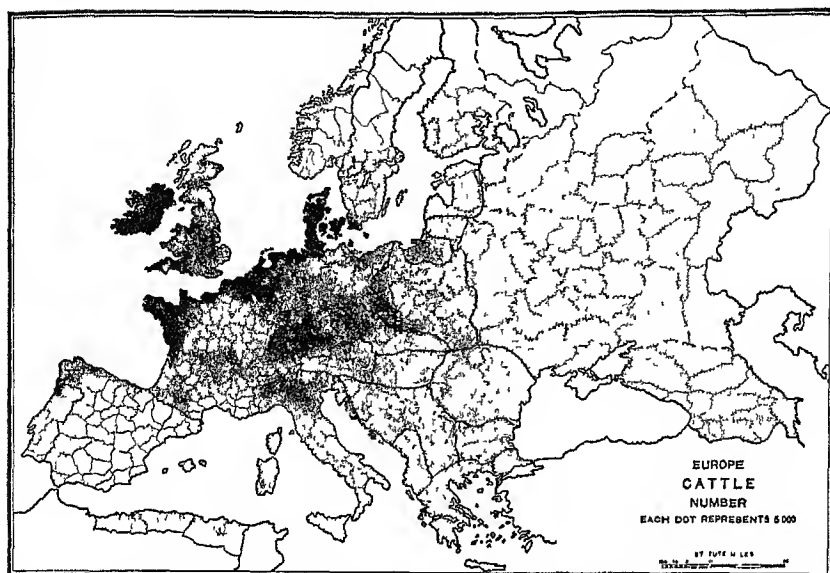
Ireland is poorly equipped with various resources. She is prac-



Distribution of rainfall in western Europe. Note the heavy rainfall in the western parts of the British Isles. Why is the rainfall in the eastern part of the United Kingdom much lighter—20 to 40 inches?

tically lacking in necessary minerals, and has comparatively few large industrial centers. The people therefore depend upon agriculture as a means of livelihood. Even in this occupation, however, they have never been well off. When crops have failed, large numbers of people have migrated to foreign lands, chiefly to the United States.

Livestock and crops. The luxuriant natural grass constitutes excellent pasturage for livestock, and livestock products make up a value of 80 per cent of all commodities sold by the farmers. Ireland contains more cattle to the square mile than may be found in any other part of the British Isles. Look at the map on the next page and study the distribution of cattle in western Europe. The wet pasture lands of Ireland are better suited to cattle than to sheep. Most of the farmers also keep a few hogs and a number of chickens. Live cattle, meat, eggs, butter, and milk are sent to the densely populated industrial districts of western England, where they find a ready market. Many live cattle are shipped to England for purposes



Distribution of cattle in Europe The great density of cattle in Ireland is because of its cool, moist climate and extensive areas of wet pasture The concentration of cattle along the coastal regions of Europe from western France to eastern Denmark represents one of the world's foremost regions of commercial dairying (Adapted from U. S Dept. of Agriculture map)

of fattening, and they are later sold in the densely populated industrial centers, especially the Lancashire region of western England

Crops are grown mainly as feed for livestock Of these crops, hay and oats are noteworthy. Both grow well and give large returns in cool, moist regions. The potato crop is also important and furnishes the staple food of the peasants A study of the world's potato crop shows that the chief regions of production have average summer temperatures of less than 65° F. Such conditions are also found in Ireland Only Germany is a close rival of Ireland in the per capita production of potatoes. The climate of the country also favors the raising of flax, especially in northern Ireland Here flax is grown for the linen factories of Belfast. But the linen industry has outgrown the domestic supply of flax, and the fiber must be imported in large quantities.

Lack of harmony between northern and southern Ireland. Northern and southern Ireland show differences in their social and economic life. These regions have long been antagonistic toward one another. Northern Ireland, which consists mainly of the province

of Ulster, has developed moderately important manufacturing industries and foreign trade, while southern Ireland is inhabited chiefly by poor peasants, who have long suffered from the burden of heavy taxes. In general, the people of this southern area have been less progressive than their northern neighbors. Although they are a kindly and talented people, they tend to harbor old traditions and grievances. They have long opposed British rule and finally won their fight for home rule. With an area of 26,600 square miles and 3,000,000 people, southern Ireland was known as the Irish Free State. Since December, 1937, its name has officially been Ireland (Eire). It is still a part of the British Empire and occupies among the self-governing Dominions a position comparable to that of Canada. On the other hand, northern Ireland, with an area of 5,200 square miles and 1,200,000 people, constitutes part of the United Kingdom, the other parts being England, Wales, and Scotland.

QUESTIONS AND EXERCISES

1. Make a list of agricultural products produced in large quantities in western Europe and another list of commodities that are either lacking or grown only in limited amounts in this region.
2. Why has Germany maintained a comparatively important agricultural industry, while Britain is dependent largely on foreign countries and her possessions for foodstuffs?
3. What has made it possible for farmers in certain west-European countries to produce more than two times as much per acre (of several selected crops, such as wheat, potatoes, and oats) as we do in the United States?
4. Explain the decline of crop land in the United Kingdom.
5. Why are oats comparatively more important than other cereals in the British Isles? Why is wheat grown chiefly in eastern England?
6. Give reasons for the importance of pastures and hay lands in the British Isles.
7. In which area—the Irish Free State or the United Kingdom—would you expect to find the greater use of pasture lands and comparatively lower consumption of hay? Before giving your answer consider the climate of Ireland as compared with that of England. Which has the milder climate? Which has the greater amount of lowland pasture?
8. The great sheep lands of the world have a dry climate and comparatively low population densities. Such conditions are not found in the United Kingdom. How, then, do you account for the great significance of the sheep industry in that area?

9. Great numbers of Irish peasants have migrated to America Does our study of Ireland's agriculture suggest reasons for such migration?
- 10 Britain produces most of the potatoes that she consumes, whereas the greater part of the wheat is imported Explain

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WESTERN EUROPE—THE AGRICULTURAL
INDUSTRY (Continued)

DAIRYING IN DENMARK—A STUDY OF
SPECIALIZATION AND CO-OPERATIVE
METHODS

Denmark as part of the European Lowland. In environment as well as human activities, Denmark is more like western than northern Europe. Although it is one of the Scandinavian countries because of the fact that the people are similar to the inhabitants of Norway and Sweden in race and language, it nevertheless also differs in several respects. Denmark covers an area of only 16,000 square miles of land located in the western part of the great lowland of Europe. This lowland is narrow in the west and widens eastward, reaching its greatest size in Russia. On the other hand, Norway and Sweden are largely highland countries. They are a part of the large, hard-rock highland that is known as the *Fenno-Scandian Shield*.

Since most of Denmark consists of level and rolling land, there is comparatively little land that goes to waste. About 66 per cent of the total area of the country is devoted to crops, as compared with only 10 per cent in Sweden and 3.5 per cent in Norway. Denmark also shows exceedingly high crop yields per acre, and in this respect the country is more like the Netherlands and Belgium than the countries of northern Europe. Denmark has also become one of the leading nations in the world in per capita foreign trade. This trade development has been associated with Denmark's high degree of specialization in dairying.

Development of the dairying industry. Although Denmark is one of the leading producers of dairy products in the world, her dairying industry was at one time comparatively unimportant. The large-scale dairying business of Denmark has come about mainly during the last 60 years. Some 60 years ago Danish agriculture centered chiefly about mixed farming and the production of grain. Much wheat was grown on large estates and sold to other parts of Europe. Great numbers of poor peasants lived in tiny villages and worked

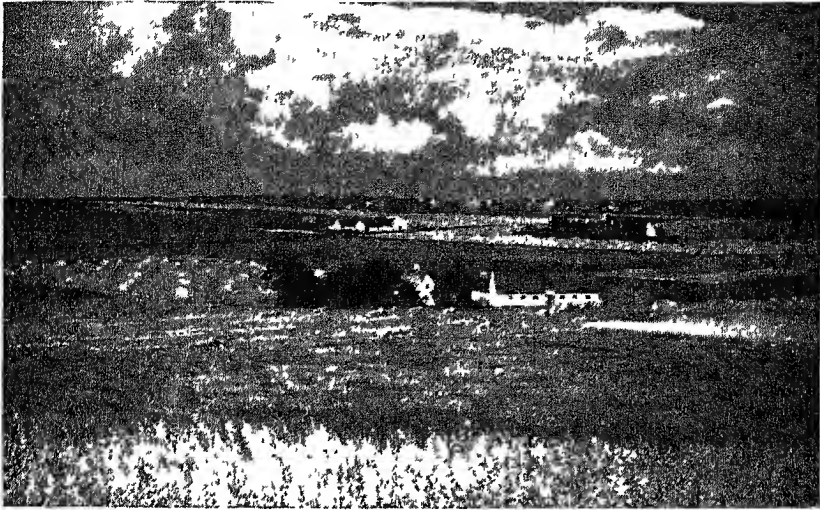
for wealthy estate owners. With this system of agriculture, the soil was robbed of its fertility. A large part of Denmark has sandy soil, which generally becomes worn out more rapidly than heavy loam and clay soils. Then, to make matters worse, the European markets began to be flooded by cheap grain from the virgin lands of America. Gradually Denmark lost the European markets for export grain, and faced the most critical situation in its history. But the Danes are a capable and remarkably active people. They sought a way out of their difficulty by making a careful study of the possibilities of their own country. They discovered that Danish soil and climate, though moderately well suited for the production of grain, is better adapted to the growth of crops that can be consumed by dairy cattle. Thus the dairying industry was developed. A system of education was also designed to meet the needs of this new system of agriculture. Many rural high schools and People's High Schools provided training for adults as well as children. The government also cooperated with the people and made it possible for them to build schools, purchase farms, and develop agricultural experiment stations.

Subdivision of the estates. With the aid of the government, the large estates were subdivided and sold to the peasants. This process of dividing large landholdings proceeded with remarkable rapidity during the eighties and nineties of the last century, until in 1936 more than 50 per cent of Danish farms contained less than 13 acres apiece. More than 90 per cent of the farms are owned by the peasants themselves.

Danish crops. Although Denmark has changed from commercial grain culture to livestock farming, crop production is still given an important place in the Danish system of agriculture. But instead of producing crops for sale to foreign countries, the Danish farmers now grow crops chiefly for use as feed for their own farm animals. Hay, oats, root crops, rye, and barley are most important. Hay, oats, and root crops give large returns in regions which have a moist, cool climate. The rye crop is especially well suited to sandy soils such as cover a large part of Denmark. Barley requires a comparatively short period of time to reach maturity, and it is an excellent feed for livestock. Wheat is still grown in Denmark, although it is a minor crop. It is practically confined to the drier southeastern islands. Although many other countries have a much more favorable climate for wheat culture, the yields per acre in Denmark are



Two pleasant agricultural landscapes in Denmark Above, crop lands and dairy cattle Below, a heavy yield of grain. (Photos by Jonals Company, Copenhagen)



Danish landscape. In the foreground is a field of oats, a crop that thrives in a cool, moist climate. Land in Denmark is used with great care, most of the crops produced being used as feed for dairy cattle. Gently rolling areas like this are found throughout Europe. (Photo by Jonals Co., Copenhagen.)

surprisingly high. Danish farmers produce on the average more than 40 bushels per acre as compared with only 15 in the United States. Such high yields are obtained because the crop generally occupies the best land, in a system of crop rotation in which it is given considerable care and attention. Comparable yields per acre are obtained in the neighboring countries of the Netherlands and Belgium, and for similar reasons.

The livestock. Denmark is the leading country in Europe with regard to number of animals per square mile of land. In number of cattle to the square mile she is surpassed only by the Netherlands, but she ranks first among European countries in the number of hogs, horses, and total animal units per square mile. This small country possesses more than 3,000,000 head of cattle, nearly 5,000,000 hogs, and more than 21,000,000 poultry. The raising of hogs and poultry has gone hand in hand with the development of the dairying industry. By-products, such as skimmed milk, are used in large quantities as feed for these animals. Moreover, the luxuriant Danish pastures may be used for hogs and poultry as well as for cattle.

Co-operative societies. Much of the success of Danish agriculture can be attributed to the co-operative societies. Through these or-

ganizations Danish farmers co-operate or work together in selling their farm products and in purchasing feed, machinery, and many other commodities. Tens of thousands of very small farms would constitute a decided disadvantage if each farmer had to market his own farm products and purchase his own supplies. The co-operative societies can help through the large-scale purchases of supplies and the large-scale sale of farm products. The farmers therefore obtain comparatively higher prices than they could individually for what they sell and pay comparatively less for the machinery, feed, and clothing which they buy.

The co-operative method and how it works. In Denmark there are buyers' (consumers') as well as sellers' (producers') co-operatives. Buyers' co-operatives import large quantities of feed, food, machinery, and many other items. Farmers who are members of the buyers' co-operatives benefit by the low price at which they can purchase such commodities. Since these organizations can purchase in large amounts, they are generally able to buy wherever high-grade goods are available at low price. Purchase of British goods is generally encouraged, and "buy British" is a slogan of Danish traders. Britain is favored because the Danes sell most of their surplus butter, eggs, and bacon in the British markets.

Sellers' co-operatives handle more than 90 per cent of the surplus farm products. They also own large creameries, butter factories, and meat-packing plants, inspect and stamp goods passing through their hands, and supervise all exports.

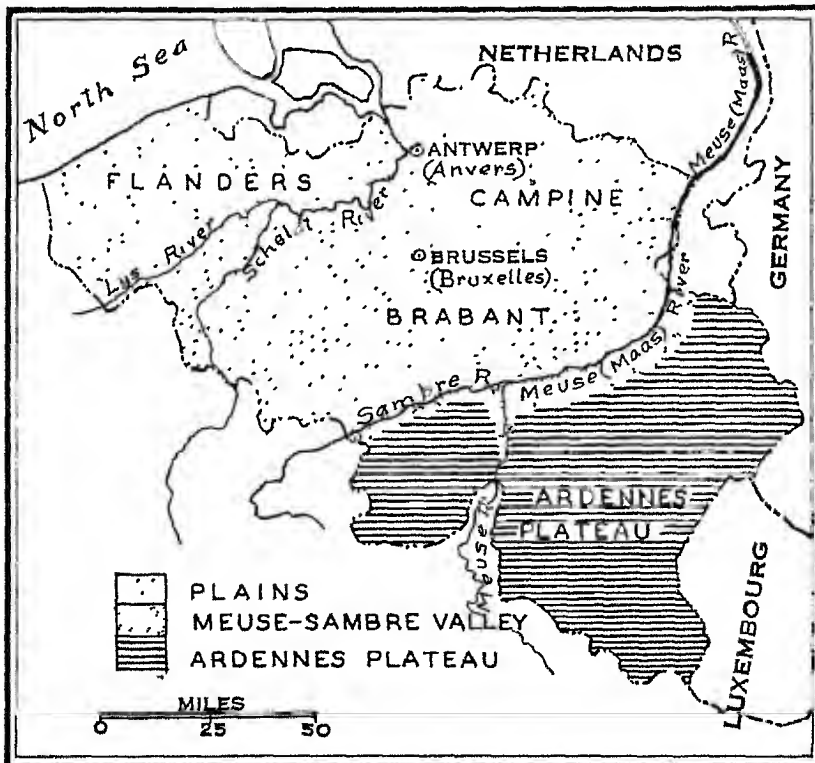
Uniform products obtained from co-operatives. There are hundreds of co-operative creameries in Denmark. In the development of any single creamery the farmers of the district in which this building is to be erected, work together or co-operate in supplying the necessary capital for construction and maintenance. They then haul their milk to this building, where they obtain credit according to the amount and quality of their product. At the creamery the cream is removed and the skimmed milk is returned to the farmers, who use this by-product as feed for calves, hogs, and even for poultry.

Although the creameries often make their own butter, many of them send the cream to butter factories that are also operated on a co-operative basis. If each farm were to make butter, there would be a lack of uniformity of grade. Just think of the many different grades of butter that would be produced where there are tens of

thousands of small farms! But in Denmark these small farms send their butter to the creameries, and many creameries send cream to butter factories where only trained experts are employed. Thus a uniform product of high grade is obtained.

NETHERLANDS AND BELGIUM—A STUDY OF INTENSIVE AND SCIENTIFIC AGRICULTURE

Population as related to agriculture. Belgium and the Netherlands are among the most densely populated countries in the world. No other entire country of Europe equals them in population density. Only England—which is part of the United Kingdom—has more people to the square mile. Belgium has 735 people to the square



Major physical divisions of Belgium. Note the location of Flanders and Campine in the great plain of Belgium.

mile, and Netherlands 639 With such great population densities the food supply of these nations becomes a matter of great importance. Thus many of their inhabitants make a living by farming, and the farm population is surpassed in numbers only by those engaged in manufacturing

Large proportion of farmers among the Flemings. Belgium contains two distinct groups of people—the Flemings and the Walloons. Like the inhabitants of northern Europe, the Flemings are tall, fair, and long-headed. They are found mainly in the Belgian plain. Look at the illustration on page 379 and notice the extent of this plain. You will see that it contains important lowlands, such as Flanders and the Campine. (Illus. below) This plain is not only the home of the Flemish weavers who spread the art of weaving fine textiles to other countries, but it is also the heart of agricultural Belgium. It is the land of the Flemish peasants, who practice intensive methods as they cultivate their tiny fields. On the other hand, the Walloons inhabit the Sambre-Meuse Valley and the Ardennes Plateau. Unlike the tall, fair Flemings, the Walloons are short, dark, and stocky, like



Agricultural scene in Flanders. In this western, lowland part of the country the landscape is somewhat suggestive of the Netherlands. (Photo by Oblut, courtesy Belgian Consulate.)

the highland peoples of central Europe. The Flemings are related to the Germans and Dutch in speech and culture; whereas the Walloons speak French. Just as the Flemings are engaged mainly in agriculture and commerce, so the Walloons are the industrial leaders of Belgium. The Walloons predominate in the mineral regions and are therefore engaged in the manufacture of iron, steel, and other mineral products. Among their numbers are also found many of the political leaders.

In the Netherlands there is much greater uniformity of race from place to place. The tall, fair Nordic race predominates. In contrast to popular opinion, the agricultural workers of the Netherlands are outnumbered by those engaged in manufacturing. A large farm population is found in the western lowlands, where the grim Hollanders have waged a long struggle against the sea.

Intensive and scientific agriculture. The agriculture of the Netherlands and Belgium is both intensive and scientific. The great population density of these countries has made it necessary for the inhabitants to make good use of their environment. They also apply scientific methods in solving their agricultural problems. Intensive agriculture means that there is much power—human, animal, and machine power—applied to each acre of land. That this is true in the Netherlands and Belgium is shown by the fact that the small, carefully worked farms yield large returns. Most of the farms in the Netherlands are less than 12 acres each, and the average farm in Belgium contains only three to four acres. These farms show exceptionally high average yields per acre of potatoes, rye, oats, barley, wheat, and sugar beets. Belgium and the Netherlands surpass the United States in average yields per acre in a number of selected crops. Yields have been increased by the application of science to their agriculture. They have built agricultural experiment stations in which they experiment with different crops and fertilizers. It is of interest in this connection to note that the three leading nations of the world in the consumption of commercial fertilizers per square miles are the Netherlands, Belgium, and Germany.

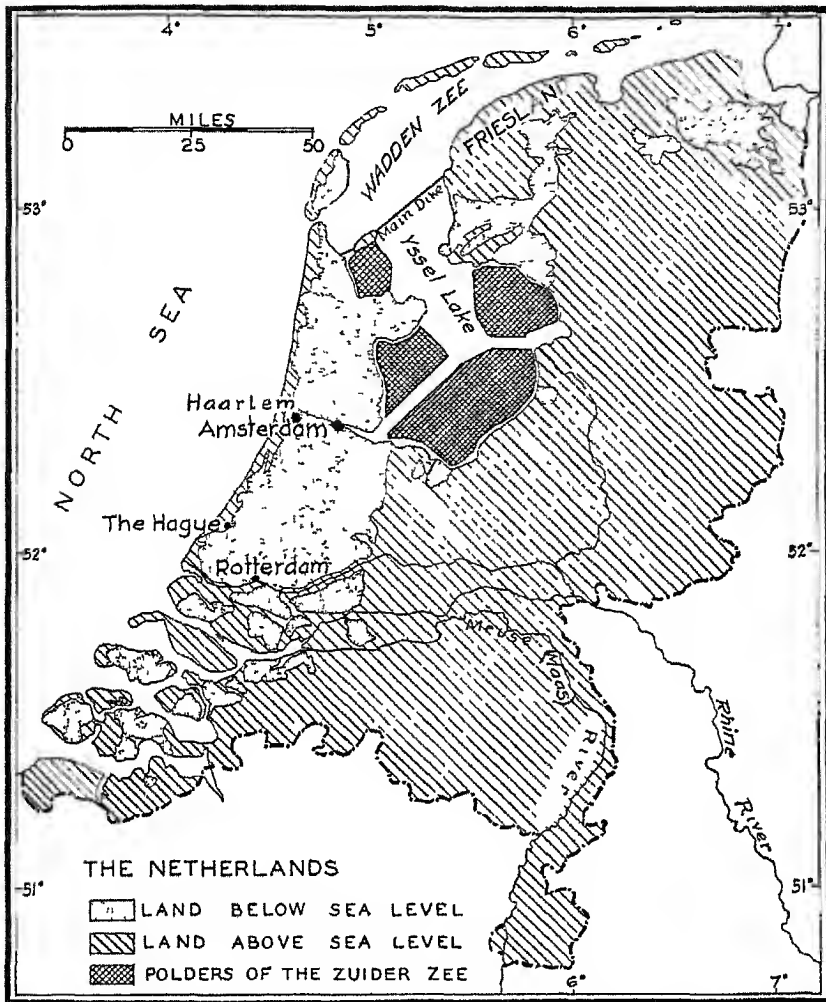
The livestock industry has also reached a high point of development in the Netherlands and Belgium. The Netherlands ranks first among European countries in number of cattle per square mile and first in average milk production per cow. Belgium ranks third in number of horses and hogs per square mile of land.

Four major advantages. The high degree of development of the agriculture of the Netherlands and Belgium is related in one way or

another to four major factors. These are (1) a favorable location, (2) much level land, (3) a favorable climate, and (4) long experience due to early development. These countries are located at the very "front door" of Europe, where other nations may be reached by way of canals, rivers, railroads, roads, and the sea. They occupy the seaward end of the rich Rhine Basin. Located within the most densely populated part of Europe, they have excellent markets for their agricultural exports. The levelness of the land has made it easy to develop land and water transportation, and there is comparatively little land that goes to waste because of rugged relief. Belgium and the Netherlands are among the leading nations in the world in the development of transportation. Belgium surpasses all other countries in respect to railroad mileage relative to area. The westerly winds blow over this low land surface and bring a moist, cool climate quite similar to that of Denmark. The temperatures, however, are slightly higher. A long growing season, mild winters, and a well distributed rainfall all favor their agricultural industry. Then too, agriculture has had a long history in these countries. They have had a long time in which to gain the necessary experience in agriculture. Thus in various ways they have learned through the course of time how to make good use of their environment.

Making new land—the polders. Western Netherlands and northern Belgium contain large areas of low land which require drainage before crops can be grown on them. Study the map on the next page and you will see that a large part of the Netherlands lies at or below sea level. This western lowland is kept from flooding by means of high dikes that are constructed along the seashore and along the banks of rivers and canals. The land thus enclosed by dikes is constantly drained by means of pumps. These were operated in former years chiefly by means of windmills. Even today windmills are used for this purpose, but much more efficient electrical pumps do most of the work. The water is pumped from these protected lands or "polders" into canals, which flow slowly and sluggishly to the sea. The canals serve a threefold function of drainage, navigation, and irrigation. Here canals actually take the place of streets. As in Venice, people travel from place to place by boat.

The modern Zuider Zee project. Many of the diked and protected lowlands or polders have been reclaimed from the sea. The map on the next page shows one of the largest drainage projects in the history of the world. The very map of Europe is being changed. What was once an embayment known as the Zuider Zee is now in



The major physical divisions of the Netherlands. Notice the large reclamation project of the Zuider Zee. The only remaining body of water in this former embayment of the North Sea is Yssel Lake

the process of being reclaimed. A long dam which cuts off the Zuider Zee from the North Sea was completed in 1932. This great dam is 330 feet wide, 20 miles long, and will accommodate a railway and a modern road. Thus, for the first time in modern history, land transportation will take place across the entrance to the Zuider Zee, now known as Yssel Lake. Back of the dam, four large polders—tracts



An agricultural landscape in the polder area of western Netherlands. Canals serve the purpose of streets, the peasants traveling from place to place in boats (Courtesy Netherlands Railways)

of land reclaimed from the sea—when completed will add 550,000 acres of land to a land-hungry country. The northwest polder, 135,000 acres in area, has already been completed and is at the present time producing crops.

The extraordinary richness of polder lands is due to the fact that they are composed of alluvial mud that has been deposited through the ages.

Farming in the Netherlands and Belgium. The climate of the Netherlands and Belgium favors the growth of grass, oats, rye, and root crops, such as sugar beets, potatoes, and turnips. On some of the western polders of the Netherlands one will find the world's largest fields of tulips, hyacinths, crocuses, lilies, and other bulbous flowers. These flowers are grown chiefly for their bulbs, which are dried and then sent mainly to other parts of Europe and to the United States. In the map on page 383 locate the city of Haarlem, the leading center of Europe's flower-bulb industry.

As has already been stated, Belgium and the Netherlands are two of the leading nations of the world in the production of large crops per acre of cultivated land. But they are also noteworthy in various

phases of the livestock industry. For example, in the Netherlands dairying is the most important phase of the agricultural industry. Here the crops, such as grass, grains, and tubers, are grown mainly for livestock. Black-and-white Holstein cows predominate, and these animals have been developed to a high point of productivity. In fact, the Netherlands surpasses all other countries in the world in average milk production per cow. Butter and cheese are produced in large quantities for home use as well as export. In the Belgium plain, the rich grass constitutes feed for some of the finest draught horses in the world. They are raised in large numbers in Flanders. Dairying is also well developed in the Belgium plain, chiefly in the Campine. Find the Campine in the illustration on page 379.

Degree of self-sufficiency in foodstuffs. The foregoing study of agriculture in the Netherlands and Belgium has given us ample proof of the fact that their inhabitants make good use of the environment. Yet the tremendous pressure of population means comparatively little food produced per capita. In spite of the high agricultural production, these countries do not produce enough food to supply their own needs. Fortunately great numbers of the population of both countries are engaged in manufacturing and commerce, as we shall see in the following chapter. Many foodstuffs are obtained in exchange for manufactured goods that are sent to foreign lands.

GERMANY—AN IMPORTANT AGRICULTURAL AS WELL AS INDUSTRIAL NATION

Feeding a large population. The German population has increased from 41,000,000 in 1871 to about 70,100,000 at the present time (according to the census of 1939). Germany has, therefore, a much larger population than either the United Kingdom or France. Of European countries, only Russia exceeds Germany with respect to number of people. But Russia's population is spread over a large area of land, whereas Germany contains only 181,700 square miles. Thus Germany's population density has reached 386 to the square mile, as compared with only 56 per square mile in European Russia and 44 in the United States. Even France, a country that is quite comparable to Germany in size, has a population density of less than 200 to the square mile of land.

With the remarkable growth of Germany's total population during

the last 60 years, increasing numbers of people have moved from the farms to the cities. During the seventies and eighties of the last century most of Germany's people were engaged in agriculture. Farming was then the all-important occupation, whereas today the agricultural workers make up only 29 per cent of the total working population. During the seventies and eighties of the last century, cheap American grain was sent in vast quantities to Europe. Germany's farmers and the farmers of other European countries were hard hit by this new competition. Should they permit the low-priced American grain to compete with the domestic product, or should their own farmers receive government protection by means of high import duties? This was the all-important question from the standpoint of agriculture, which was then the most important occupation. As we have already seen, Denmark changed her system of agriculture, and Britain, through the policy of free trade, permitted the cheap American grain to enter her country duty-free. But Germany protected her farmers by means of the import tariff. In fact, during the last 60 years Germany has tried hard to become independent, as far as possible, of foreign sources of food. Great numbers of the German population believe that they might become more nearly independent of outside sources of food if they could regain possession of their former colonies.

Use of science in agriculture. With a large population density to the square mile and a tremendous number of factory workers, Germany is unable to be entirely self-sufficient. Yet most of the food—about three-fourths—consumed by Germany's people is produced by her own farmers. In view of the large stretches of sandy land in the northern lowlands and extensive highlands in the central and southern parts of the country, Germany has shown a remarkable ability as a producer of food. She has long been the leading beet-sugar producer in the world. Until recent years, when Russia surpassed her in total output, she also ranked first in the production of potatoes. She is surpassed only by Russia in the output of rye. Abundant yields are obtained from a number of other crops. In addition, she has developed a very important livestock industry, major emphasis being placed on dairying and hog raising. These agricultural accomplishments have been realized mainly because of the effective application of science to agriculture.

Agricultural experiment stations have been established in various parts of the country. Experiments have been conducted to determine



Typical scene in the dairy-hay-pasture belt of northern Germany. This picture was taken at Husum, located in Schleswig near Denmark. (Courtesy German Railroads Information Office, New York)

the rotations best suited to certain soil conditions. Scientific cultivation of crops and scientific selection of seed have also been given much thought and study. German scientists found artificial fertilizers that could take the place of more expensive imported products. They devised a way to take nitrogen from the air and therefore became independent of the natural nitrate of Chile. They found that the waste given off in the blast furnaces when pig iron was manufactured had a high phosphorus content. It could therefore take the place of imported rock phosphate. In addition, Germany possesses the world's largest natural reserves of potash. Thus the three important mineral plant foods—nitrate, phosphate, and potash—were made available to the German farmers.

The dairy, hay, and pasture lands. Look at the map on the next page and notice the various agricultural regions of Germany. The northernmost of these regions is located along the North Sea and the Baltic Sea. It includes the northern part of the Prussian Plain and the northern part of East Prussia. Here the natural environment is somewhat similar to that of the neighboring countries of Denmark, the Netherlands, and Belgium. It is a low coastal region that is very wet in some places. Near the Netherlands in the northwest, much of the land has had to be drained. Here the windmills, the dike, and the polder are all much in evidence. Just as in



The major agricultural division of Germany. Notice the five numbered areas of wheat, sugar beets, and barley culture. These areas also contain Germany's leading industrial districts.

the neighboring countries, so also here, the environment is best suited to pasture, hay, and tubers. Accordingly, the dairying industry has been developed to a high degree. Hay, pasture, and dairying also characterize the agriculture of southern Germany, where the land rises to high levels near the boundaries of Switzerland and Czechoslovakia. Study the location of these areas in the map at the top of the page. Unlike the low northern region, these are not coastal lands. Give some reasons why these southern areas also are devoted to pasture, hay, and dairying.

The rye, potato, and oats lands. From a study of the map at the top of the page, you will notice that the largest agricultural region of Germany is located just to the south of the northern dairy, hay, and pasture belt. It stretches diagonally from southwest to northeast across the entire country, and embraces most of the Prussian Plain and large stretches of land in west-central and eastern Germany. In this large

region there is also some dairying and much land devoted to hay and pasture, but most important are the rye, potato, and oat crops. This region accounts for the greater part of the rye, potatoes, and oats grown in Germany each year. Both rye and potatoes are adapted to the sandy soils that are found in this part of Germany. Rye and potatoes give better returns in regions that have warm rather than hot summers. By warm conditions we mean temperatures that range from 50° F. to 68° F., and by hot, above 68° F. In Berlin the average temperature for July, the warmest month, is 65° F. The average for the entire summer season is, of course, even lower. Moreover, the use of an abundance of fertilizer, chiefly potash, found in the valley of the Elbe River, has greatly increased the yields per acre, even on coarse sandy soils.

The rye, potato, and oat crops are used as feed and food. Study the distribution of the potato acreage, as shown in the map on page 388. The potato is an important food for the peasants, and it is much cheaper than maize or Indian corn as a feed for livestock, since Germany is not a corn producer and must import its corn, chiefly from Argentina. In Germany potatoes are fed to hogs. Germany raises more of these animals than does any other country in Europe. Potatoes are also used in large quantities for the manufacture of starch and flour, and in the distilleries for the making of motor alcohol. Imagine automobiles run on alcohol obtained from potatoes! In our discussion of manufactures in western Europe we shall see some reasons for this use of potatoes as a source of fuel. Rye is also an important food for the peasants, for the country as a whole the rye acreage surpasses that of any other grain. The oats crop generally occupies an important place in the crop rotation and in acreage ranks next only to rye. It is used chiefly as a feed for livestock.

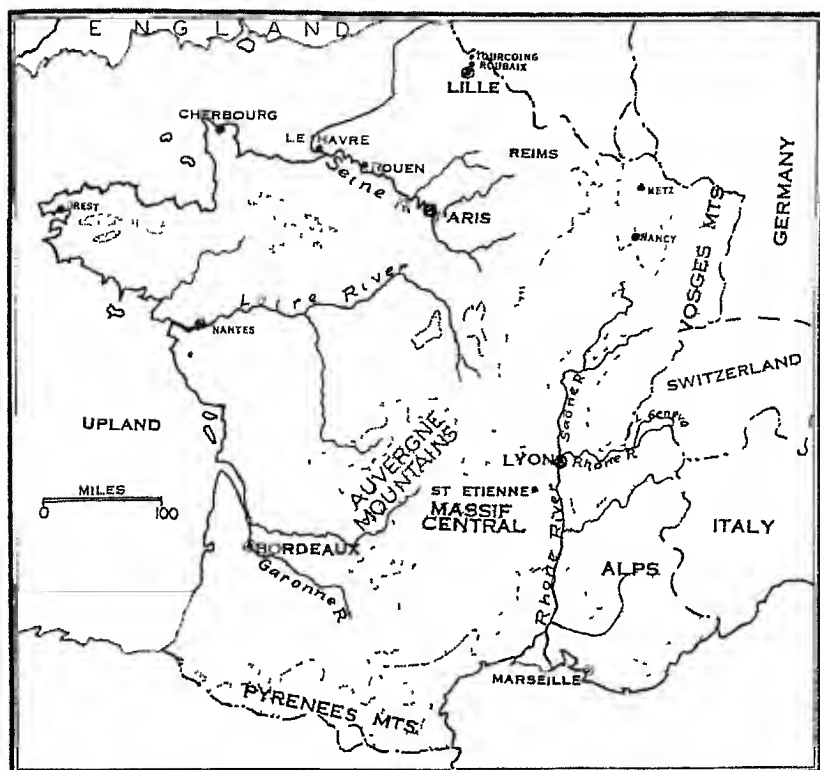
Regions in which sugar beets, wheat, and barley are most important. Look at the illustration on page 388 and notice five areas in which sugar beets, wheat, and barley occupy a very important place in the system of agriculture. You will see that these areas are numbered from 1 to 5. They all have river valleys and alluvial soils, and they contain the most highly industrialized districts of Germany. The combination of rich alluvial soils and great population densities suggests the importance of wheat, sugar beets, and barley. Wheat generally gives much better returns on fertile, dark soil rather than on light sands. Sugar beets also must have fertile

soils for best results. The greatest area of sugar beet production in Germany is the Saxony Region (area 2). Much hand labor is required in the cultivation and harvest of the beets. These areas have an abundant labor supply. They also consume much beer and have many breweries. Barley has therefore become an important crop, since it is made into malt and used for brewing purposes. Hops—another crop required by the brewing industry—are grown in many of the sheltered valleys of these areas. Munich (München) enjoys a world-wide reputation for her brewing industry. Munich is located in the area marked number 5 in the agricultural map. You will notice that it includes most of the German section of the Danube River Basin. Here many sheltered valleys and fertile alluvial soils favor the growth of barley, hops, wheat and sugar beets.

AGRICULTURE IN FRANCE

Importance of agriculture in France. Agriculture occupies a comparatively more important place in the economic life of France than of the other great powers of western Europe. With a larger land area and only two-thirds as many people as Germany, France depends, relatively, more upon agriculture. The country is also favored with different types of climates, such as the mild, sunny Mediterranean type in the south, and a cool, moist marine climate in the northwest. A continental climate with cold winters and hot summers is found in the eastern part of the country. Variety in climate is reflected in differences in systems of agriculture from one part of France to another. There are also extensive lowlands, chiefly river basins, such as the basins of the Seine, the Loire, the Garonne, and the Rhone. The highlands (above 1,000 feet) are found chiefly in the east and southeast.

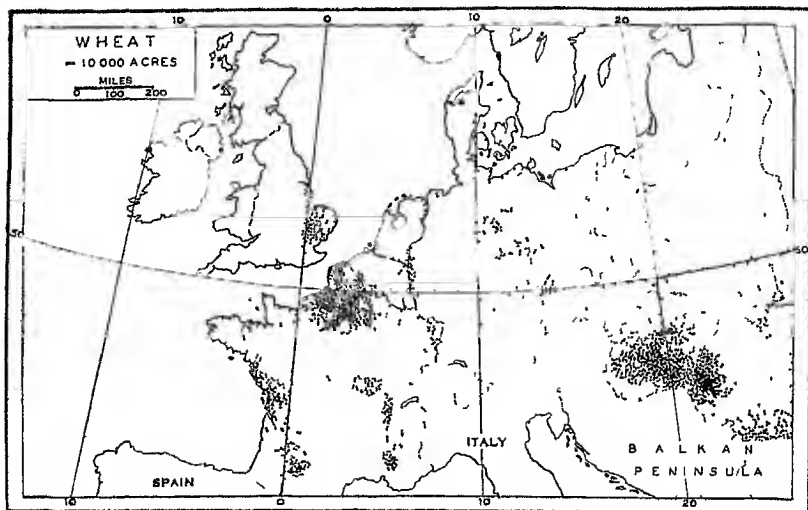
French agriculture is intensive in character. Most of the people live on comparatively small holdings, the average farm containing less than 25 acres. But unfortunately, many of these small farms are not whole, compact units. They often consist of scattered fields, which make it difficult to use labor-saving machines. Moreover, backward methods of cultivation are still found in many districts, and average crop yields in France are generally lower than those of the Netherlands, Belgium, Denmark, Germany, and the United Kingdom.



A place map of France showing the chief physical divisions. The dotted areas are highlands above an elevation of 1,000 feet.

Partly because of backward methods, the French have required protection against more efficient foreign producers. But in spite of import tariffs the French peasants are finding it difficult to meet foreign competition, chiefly in the production of grains. One of the results of this competitive struggle may be seen in the movement of many farm people to the cities.

The chief crops. France is the leading country of western Europe in the production of wheat. Study the illustration on page 392 and you will notice the major areas of distribution. The chief wheat lands are the central valleys of the Seine, the Loire, the Garonne, and the Rhone basins. Of these the Seine Basin is most important. In spite of her important place in wheat production, France imports large quantities each year.



Distribution of wheat Note the areas of concentration in England, France, and the Danube Basin

The other important cereals produced in France are oats, rye, barley, and maize. Rye is grown chiefly on poorer lands near the coast and on the upland areas. Barley is produced in large quantities in the northeast of France, where it is used in the breweries. The most important maize lands of France are in the southwest lowlands, within the basin of the Garonne, and in the lower part of the Rhone Valley.

Potatoes are grown chiefly in the cool western and northwestern parts of France, whereas sugar beets are most important in the northern and northeastern areas. In the north the sugar beet areas furnish raw material for the refineries located in Lille and Paris.

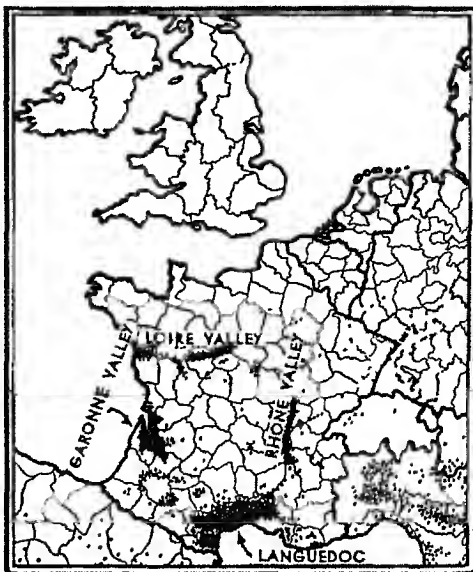
The grape industry. In the production of grapes France is the leading country in the world. It also leads in the making of wine. This large output of grapes is due in part to careful and scientific cultivation of the vineyards and to the large areas of land suitable for this type of crop. The largest and most important area is Languedoc, located in the Mediterranean coastal region of southern France. (Map opposite.) Here the long hot summers favor the production of grapes. Other major areas include the basins of the Garonne, the Loire, and the Rhone. The basin of the Garonne contains Bordeaux, one of the leading wine-trading centers of the

world Smaller areas of production are found in the eastern part of the Paris Basin (basin of the Seine), where grapes are grown on many of the sunny slopes of limestone escarpments This region produces the well-known champagne of commerce

The livestock industry. In France as in Germany, there is a widely distributed livestock industry Nearly all farms have some animals The cash income from the sale of animals and animal products makes up almost three-fourths of the total income of the average French farmer France is just about self-sufficient in this phase of agriculture, whereas she must import considerable quantities of cereals The trend is for better breeds of livestock, notably better dairy cattle

Dairying The dairying industry is best developed in the north-western coastal region, that is, in the marine peninsulas of Brittany and Normandy, and along the coast to the Belgian boundary This is, in fact, the dairy-hay-pasture region of France It is but part of a larger belt that trends northeastward through the cool, moist western lowlands of Belgium, the Netherlands, Denmark, and northwestern Germany. The two small British islands of Jersey and Guernsey, famous for the development of two well-known dairy breeds, are located just to the west of the French coast From this coastal region of France, butter and cheese are sent to the cities of the Paris Basin and even to London.

Unfortunately, in many other parts of France, cattle are not special types. They are used not only for their meat and milk, but also as beasts of burden. It is to be expected that better breeds of



Grape production in France Each dot represents 10,000 metric tons France is the world's leading producer of grapes and wine Note the major areas of production (Adapted from U S Dept of Agriculture map)

cattle will displace many of the mixed varieties, as better agricultural methods and modern farm machinery are introduced

The sheep industry In France sheep are comparatively more important than cattle on the dry highland slopes of the south and southeast and on the dry limestone ridges of the Paris Basin At one time the sheep industry satisfied the local requirements for wool, but that is no longer true Raw wool is one of France's leading items of import The sheep industry has declined as many of the grazing areas have become crop lands France now has less than one-half as many sheep as has the United Kingdom In some districts ewes' milk is used in making cheese In the upper part of the Garonne Basin such milk is used in the manufacture of Roquefort cheese.

HIGHLAND COUNTRIES OF WESTERN EUROPE

Crop production and grazing in Switzerland. With more than 4,000,000 people and less than 16,000 square miles of land, Switzerland is a densely populated country Moreover, the presence of extensive Alpine highlands made it impossible to use more than 12 per cent of the land for crops Much of the remainder consists of permanent meadow and mountain pasture Along with agriculture, the country has also developed manufacturing At the present time 25.9 per cent of the Swiss workers are engaged in agriculture, whereas 44.1 per cent are employed in manufacturing enterprises The country is unable to feed itself It depends upon foreign areas for a large part of the food supply

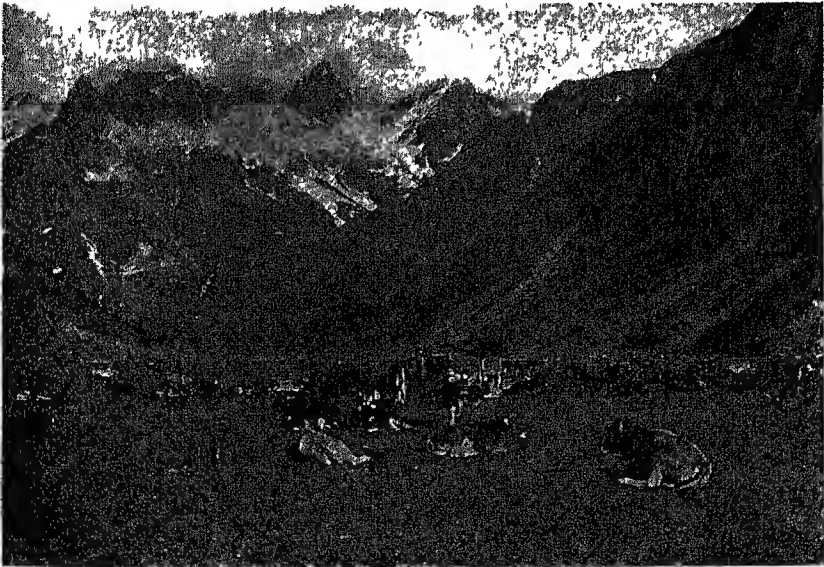
The chief crops Because of the variety of relief and climate, Switzerland contains many different kinds of crops. Of these, wheat, potatoes, oats, rye, barley, and grapes are most important Wheat normally covers the largest acreage, although potatoes yield a larger total number of bushels The chief wheat lands are located on the central plateau To the northwest of this plateau one finds the Jura Mountains and to the south are the more extensive Alpine Highlands These highland areas are noteworthy because of grazing rather than crops

Vineyards are found in many districts, notably on the sunny southern slopes of the Jura and Alpine valleys But like the grains, the grape output is insufficient for the home demand.

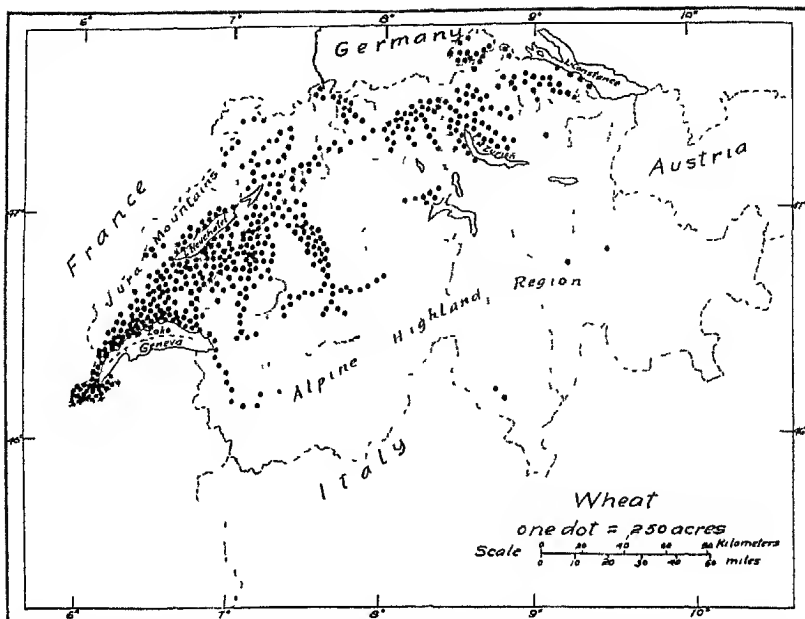
The grazing industry The natural environment of Switzerland favors the livestock industry Because of high elevation the summers are cool, even on the central plateau Study the climatic graph for



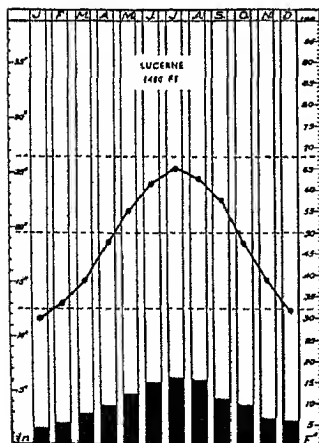
Sheep grazing on rich pastures near St Moritz, located in the Alpine Highlands of southeastern Switzerland (Courtesy Swiss Natl Tourist Office)



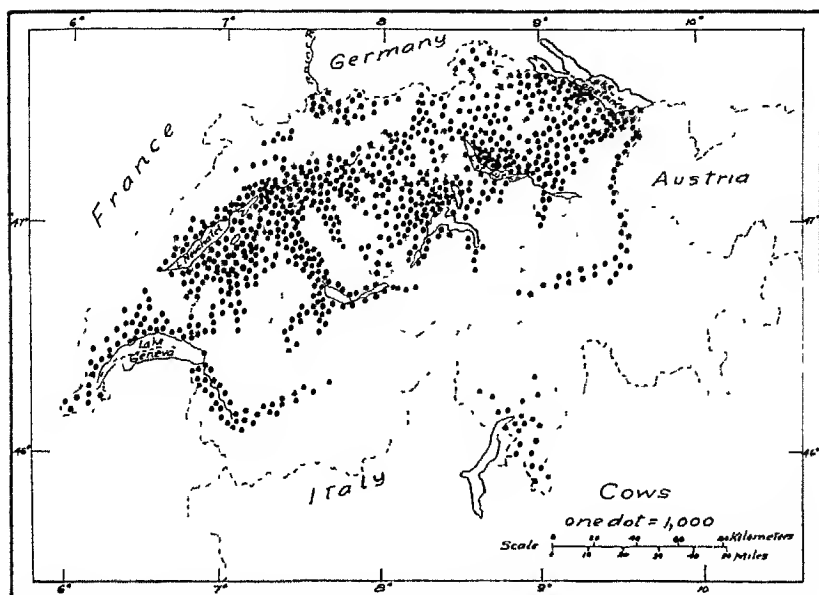
Dairy cattle in a highland valley of Switzerland. The cool upper valley districts furnish excellent pasture for livestock during the summer season. Notice the snow-capped mountains in the background (Courtesy Swiss Natl Tourist Office)



Dot distribution map of wheat in Switzerland. Wheat is Switzerland's leading cereal. Note the concentration of dots along the plateau.



Average monthly distribution of temperature and rainfall at Lucerne. Located on the central plateau of Switzerland at an elevation of 1,480 feet, Lucerne has a continental climate, as suggested by the range of temperature and the maximum amount of rainfall in summer. Note the cool summer temperatures and the abundant rainfall conditions that favor the dairyming industry.



Dot distribution map of Swiss dairy cows Most of these animals are found on the Central Plateau

Lucerne, one of the plateau cities There is also an abundant rainfall, which, together with rugged relief, explains the widespread use of highlands for permanent meadow and pasture On the higher slopes, sheep and goats are found in large numbers On the richer lower pastures cattle are raised Cattle—chiefly dairying breeds—are much more numerous than either sheep or goats In fact, Switzerland as a whole may be classified as a dairy-pasture-hay country Crops are generally grown as feed for livestock rather than for direct human consumption In many of the isolated valley areas cheese-making is an important activity Certain industries draw upon the dairying output of the country Of these, the condensed milk industry and the chocolate manufactures are noteworthy

Although dairy cattle are found in all sections of Switzerland, the Plateau contains the greatest number In the Alpine valleys dairy cattle are commonly driven beyond the upper tree line, to the alp pastures during summer, and back to the lower farm lands during winter

Austria and Hungary. Austria, like Switzerland, is dependent upon foreign lands for a large part of the food that she consumes each



Cutting grain in Austria Hand implements are still widely used in the agricultural districts of the highland countries of Europe In general, the peasants lack the capital with which to purchase modern labor-saving machinery (Courtesy Austrian State Tourist Department)

year Prior to the World War, Austria was part of the great Austro-Hungarian Monarchy, which produced an abundant supply of food, chiefly in the Hungarian part The Austrian part was the highly industrialized division of the Monarchy and little attention was given to the development of agriculture

Austria produces a number of crops, notably rye, oats, wheat, potatoes, and barley (Illus at left)

Since the World War the trend has been definitely upward in the production of these crops Larger returns have been realized by increasing the crop acreage and by improving the methods of cultivation

Austria, like Switzerland, contains much rugged land that is better adapted to the raising of livestock than for the growth of crops. As in Switzerland, the dairying industry has received much attention, and the western and southern parts of the country may be classified along with Switzerland as a dairy-hay-pasture region. The country exports some cheese, chiefly from the highland districts, and the trend has been steadily upward in that industry.

Agriculture in Hungary. Unlike Austria, Hungary is largely a lowland country. Yet its economic life is closely related to that of the adjacent highlands. Hungary occupies the central part of a vast mountain-rimmed lowland, known as the Hungarian Plain. Because of the extensive tracts of lowland, more than 60 per cent of Hungary is under cultivation, whereas only 23.5 per cent of Austria is cultivated land More than one-half of Hungary's working population is engaged in agriculture, whereas less than one-third of Austria's people work on farms Hungary is therefore largely a nation of farmers. Like most plains areas it is an important grain-producing country. Prior to the World War vast quantities of grain moved from agricultural Hungary into industrial Austria Such trade is moderately important even today

The chief grains produced in Hungary are wheat, corn, rye, barley, and oats. It is part of the important corn-wheat-livestock region of the middle and lower Danube Basin. Within recent years wheat has been the leading item of Hungary's export trade. Most of the corn is consumed within the country.

The livestock industry of Hungary is important. The country contains great numbers of hogs, cattle, and sheep. There are comparatively more hogs in Hungary than in Austria and Switzerland. The widespread production of corn has been a major factor in causing such great emphasis on the hog industry. Moreover, the cattle in many districts are raised for their meat and hides rather than for milk. Cattle and sheep are sometimes driven from the adjacent highlands into the Hungarian Plains, where they are fattened. In some respects, therefore, the Hungarian lowlands are comparable to the Corn Belt of the United States, especially the southwestern part of the Corn Belt. Just as many Corn Belt farmers buy lean cattle from the western grazing areas, so many Hungarian peasants sometimes buy livestock from the near-by highland districts.

Since Hungary is poorly equipped with industrial raw materials and fuels for manufacturing, it seems likely that agriculture will long remain a leading occupation. Improvements in agricultural conditions are therefore of great importance to the welfare of the nation as a whole. Many of the peasants are poor and work farms that are much too small. Such holdings cannot provide an adequate standard of life. On the other hand, a large part of Hungary (about 30 per cent) is still occupied by large estates. A further subdivision of such large holdings appears necessary in view of the ever increasing agricultural population of the country. Moreover, better agricultural methods and modern machinery are greatly needed in many districts, but the people lack the capital for the purchase of modern farm machines.

Czechoslovakia. The Republic of Czechoslovakia consists largely of areas which formerly belonged to Austria and Hungary. Only a small area of land in the north was detached from Germany and added to the new state.

In this newly created republic agriculture is a dominant occupation. Here more people are engaged in agriculture than in any other kind of work, and 41.6 per cent of all the land is under cultivation. Unlike Switzerland and Austria, Czechoslovakia is nearly self-sufficient in the production of foodstuffs. There are, however, some

imports, chiefly meats, fats, and the bread grains (wheat and rye). But there are also exports of certain other crops, which largely offset the imports. For example, Czechoslovakia normally produces a surplus of sugar (from beets), barley, oats, fruits, and potatoes, and these commodities are listed among the exports of the country.

The best-developed agricultural districts are found in the western part of Czechoslovakia. In these western areas crop yields are high, owing to the widespread practice of crop rotation, intensive cultivation, and careful fertilization of fields. In these areas science has been called upon to help solve agricultural problems. On the other hand, many of the eastern districts of the country suffer from backward agricultural practices.

QUESTIONS AND EXERCISES

1. Why is the greater part of Denmark under crops, while only 35 per cent of Norway consists of cultivated land?
2. List the chief crops of Denmark, and explain the high yields per acre.
3. Explain the importance of co-operative societies to Danish agriculture.
4. Give reasons why the average crop yields of Belgium and the Netherlands are among the highest in the world.
5. Why has dairying become one of the most important activities in the Netherlands?
6. By what means has Germany been able to remain about three-fourths self-sufficient in agricultural foodstuffs, while Britain must import most of the food that her inhabitants consume?
7. Where are the dairy-hay-pasture regions of Germany? Study their location and explain why dairying is important in these regions.
8. What factors favor the production of large quantities of rye and potatoes in Germany?
9. Study the areas in the illustration on page 388 numbered 1 to 5. Why are these areas important in the production of wheat and sugar beets?
10. Discuss the major problems confronting the farm population of France. Why have the French farmers found it difficult to compete with outside areas in the production of grain?
11. Name the leading grape-producing districts of France. What environmental conditions favor grape culture (called also *viniculture*)?
12. In what part of France is dairying best developed? Why?
13. Why is the greater part of Switzerland better adapted for the raising of livestock than for the production of crops? Why is Switzerland unable to feed her population?

- 14 Compare and contrast the agriculture of Hungary with that of Austria. As compared with Austria, why has Hungary a much larger percentage of agricultural workers?
- 15 To what extent is Czechoslovakia self-sufficient in agricultural food-stuffs? What agricultural foods are imported? What ones are exported?

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WESTERN EUROPE—MANUFACTURING
AND COMMERCE

GENERAL CHARACTERISTICS AND
DEVELOPMENT

Importance. Among the major regions of the world, western Europe has no equal in the total production, total consumption, and total export of economic goods. The nearest rival is eastern United States. The United States surpasses western Europe in the manufacture of such products as automobiles, copper, aluminum, electrical machinery, and a number of other commodities. But western Europe surpasses our country in the sum total value of manufactures.

These two areas—western Europe and the United States—are the hubs of commerce. They are directly responsible for the greater amount of foreign trade. During a recent five-year period, 1930-1935, Europe accounted for more than three-fifths of the total imports and more than one-half of the total exports of the entire world. Most of these European imports and exports are handled by western European countries.

Factors favoring manufacturing. Many conditions have contributed to the industrial development in western Europe. This area is well endowed by nature with valuable resources, especially basic minerals. In fact, the lands bordering the North Atlantic are the best equipped of all regions with those basic resources that are necessary for a high plane of industrial life. The Industrial Revolution had its origin in western Europe. Here the first important inventions and discoveries were made that brought about the pressing, throbbing machine age of today. This movement began first in Great Britain, chiefly because of the invention of spinning and weaving machines in that country. Once machines were invented, cheap power was sought to run them. Western Europe has much power in its coal fields as well as in its waterfalls. It is a region of abundant human power and energy, partly because of an invigorating climate. The people have had the added benefit of long experience in the manufacture of many products. Surplus manufactures are sent to all

parts of the world, largely in exchange for foodstuffs and industrial raw materials. The colonial possessions of west-European countries have also played their part in this development.

Chief characteristics of western Europe's commerce. The following characteristics of the foreign trade of western Europe are noteworthy: (1) a larger foreign trade than that of any other major region of the world, (2) a very high trade per person or per capita, (3) an export trade consisting largely of manufactured goods, (4) an import trade made up mainly of industrial raw materials and foodstuffs, and (5) a large re-export trade.

Large total trade. Western Europe's large population requires an abundance of food and its industries require raw materials. Although this region produces an abundance of both foodstuffs and industrial raw materials, the demand is much larger than the supply. Accordingly, large quantities are imported. On the other hand, the great industries of the region produce more manufactured goods than the inhabitants can use. Thus manufactures are exported.

High per capita trade. A number of west-European countries rank among the leading nations in the world in trade per person. These countries are Denmark, the Netherlands, the United Kingdom, and Belgium. They tend to specialize in the making of certain products, such as British textiles, Danish and Dutch dairy products, and high-grade Belgian steel and machinery. When nations are favored with a few resources and specialize in their use, they must depend upon foreign countries for a great variety of materials. The more they wish to buy the more they have to produce of their specialties. Their power to produce more has been due to increased use of modern machinery and the application of science in the use of resources.

Exports are largely manufactured goods. Western Europe is noted for its great export of manufactures. Although some raw materials, such as British and German coal, are also included among the exports, the manufactured or processed goods greatly surpass the raw materials in value. British textiles; German chemicals, machinery, and optical goods, French silk, perfumes, soaps, and high-grade textiles; Belgian steel and machinery—these are but some of the many manufactures that western Europe contributes to the commercial world.

Imports largely foodstuffs and raw materials. In western Europe as a whole, more people make a living by means of manufacturing than by any other occupation. In spite of their intensive agriculture

the people of this region are unable to satisfy fully their requirements for foodstuffs. Some countries are worse off than others in this respect. For example, the food produced in a year's time within the United Kingdom would feed the people of that area only six weeks. But not all parts of western Europe are as highly industrialized as the United Kingdom. Nevertheless, foods are important imports in all west-European countries. Their large and varied industries also call for an abundance of raw materials, such as cotton, wool, oil seeds, lumber, pulpwood, jute, rubber, petroleum, and a long list of other items.

A large re-export trade. Leading west-European ports, such as London, Rotterdam, Hamburg, Antwerp, and Amsterdam, are actively engaged in importing goods from all parts of the world. These goods are later re-exported to other areas. Some of the re-exports are destined for sale in the landlocked countries of Switzerland, Czechoslovakia, Hungary, and Austria. Others consist of foodstuffs and raw materials obtained from colonial possessions and tropical lands.

Factors favoring western Europe's commerce. Many factors have contributed to the present importance of west-European commerce. Among these are found (1) the advantage of an early start, (2) the excellent geographical location, (3) the broken coastline with its numerous fine harbors, (4) political control over distant lands, (5) excellent means of transportation by land and sea, and (6) the ability to produce a large surplus in exchange for the goods of foreign countries.

Value of European trade to the United States. From the very earliest period of American history, the United States has sold more to Europe than to any other continent. Europe has always been and still is the leading area in which we dispose of our surplus goods. At the present time, Europe takes nearly one-half of our total exports. The most important item of this export trade is raw cotton. On the other hand, Europe has been our leading source of imports until recent years, when Asia has become a competitor for first place. From western Europe we obtain a great variety of manufactured goods. Most important in this list are the high grade textile manufactures of Britain, the chemicals, fertilizers, optical goods, and scientific instruments of Germany; and the perfumes, soaps, wines, and clothing of France. From the Netherlands and Belgium we obtain precious stones (chiefly diamonds). We also buy large quantities of seeds and plant bulbs from the Netherlands.

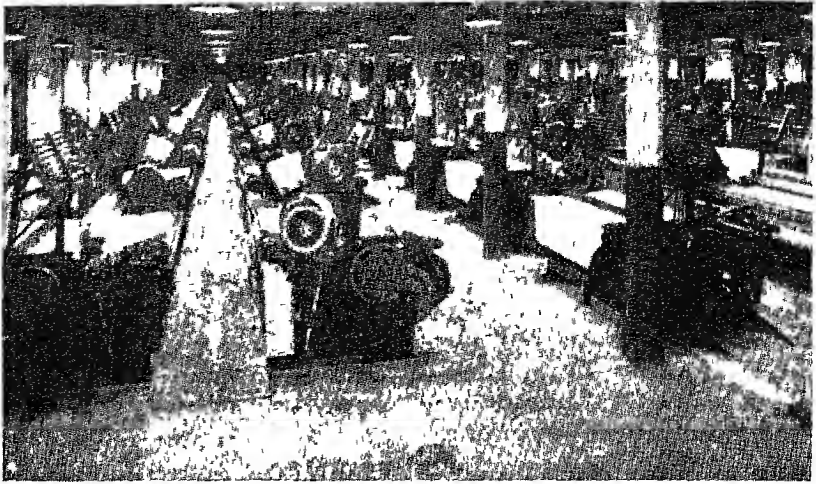
BRITISH INDUSTRY AND TRADE

Major advantages. A number of factors have contributed to make Britain a powerful industrial country and the center of the world's largest colonial empire. In situation, this island area is cut off from the mainland of Europe, yet occupies the edge of the busiest ocean. It is abundantly supplied with resources, especially coal. In size it is narrowly limited. England, Scotland, and Wales together are about the size of the state of Minnesota. Unable to produce enough foodstuffs for its large population, Britain early became an important seafaring nation. In its efforts to secure additional supplies of food and raw materials, the country developed the world's largest colonial empire and the world's largest foreign trade.

The British Isles are separated from the mainland of Europe by a strip of water only 21 miles wide. The surrounding waters gave the British freedom from invasion to any great extent. This was an important factor during the days of their military weakness. Relatively few men were needed for home defense, whereas France, Germany, and other countries on the mainland of Europe were forced to maintain large armies along their borders. Moreover, British industries were less troubled than those of the continental mainland of Europe during periods of warfare. Greater attention could be given to economic progress, and in this respect the British were truly pioneers.

The Industrial Revolution began first in Great Britain, and from there it spread over the world. Here were invented new machines for spinning and weaving. These were followed by application of steam and water power to the manufacturing industry. These modern developments gave the British a marked industrial supremacy over other nations, and for a number of years the makers of textile machinery safeguarded these inventions. From the time of its invention until 1825, textile machinery was not permitted to leave the British Isles. Moreover, all models and drawings of machines were also kept within the country. Thus the British have had the advantage of an early start as well as long experience in important branches of manufacturing. Because of their great energy and business ability, the British have been able to maintain a prominent place in world industry and commerce.

Cotton textile industry. The manufacture of cotton goods is the most important industry in the British Isles. In this industry alone



Interior of a cotton-weaving establishment in western England, showing the British Northrop Automatic Looms. Machines of this type are also exported to other parts of the world.

are engaged nearly half of all textile workers. It occupies a distinctive place in the commercial world in spite of the fact that no cotton is grown in the British Isles. No other country in the world equals Great Britain in number of cotton spindles.

The Lancashire region, west of the Pennines, is the leading area of cotton textile manufacture. (Map opposite.) It contains more than one-third of the cotton spindles of the world. This western part of England has humid air, an abundance of pure water, and rich coal fields. Water power is available on the western flanks of the Pennines. The spinning and weaving of cotton must take place in a damp atmosphere to prevent the breaking and fuzzing of the fine threads. At the present time there are artificial means of controlling the temperature and moisture in cotton textile mills. Yet in spite of this artificial control, a region that has a naturally humid atmosphere has an advantage over drier areas in the making of fine cotton goods. Western England is more humid than the eastern part of the country, since it lies directly in the path of the moist westerly winds. It is also conveniently located for the import of American cotton, which is handled largely at Liverpool and Manchester. Although Manchester is an inland city, it is connected with the sea by means of the Manchester ship canal, which is $35\frac{1}{2}$ miles long.



Major textile manufacturing districts of the British Isles (Since December, 1937, the Irish Free State has been known officially as Ireland)

Manchester has become the great collecting and distributing center of the textile industry. Here roads, railroads, and waterways converge. But the industry has also spread beyond the borders of the city into neighboring towns. Many of these towns specialize in spinning. Other cities and towns scattered throughout the Lancashire region tend to specialize in various other branches of cotton manufacturing. Some are engaged in weaving, others in bleaching; while still others are noted for their printing and dyeing of textiles.

The Lancashire cotton textile industry has met increasing foreign competition. In the Far East, Japan has developed a textile industry

of first magnitude India, one of Britain's chief markets for cotton goods, is gradually increasing her own textile industry. Many other countries also show upward trends in production. Since Britain must import all the raw cotton required for her industry, she is somewhat at a disadvantage as compared with the United States. In the face of this world-wide competition, the British have specialized in the manufacture of finer and more expensive cotton fabrics.

The woollen industry. The manufacture of cloth and yarn from wool is an old industry in the British Isles. It started in the homes of the farmers, where the work was done by hand. As machines were invented and water power used to run them, the industry moved to the flanks of the highlands, chiefly in Scotland and England. The highland regions not only furnished the necessary water power, but they also contained extensive pastures for sheep. But the final step in the location of the industry came with the large-scale development of Britain's coal fields and the use of steam as power. Then largest factories moved to the accessible highland regions, which contain coal. Thus the British woollen industry became concentrated mainly on the drier eastern side of the Pennine Mountains in the region of Yorkshire, just as the cotton textile industry is located chiefly on the more humid western side of those highlands (Illus., p. 407). About three-fourths of the workers engaged in the British woollen industry are found in Yorkshire. This region not only has coal and water power, but the drier eastern Pennine slopes contain excellent sheep pastures. Moreover, many Flemish weavers moved into this region from Flanders, now part of Belgium. The presence of skilled weavers greatly aided the industry. In fact, Yorkshire was the leading textile-manufacturing area of the British Isles before the large cotton textile industry was developed in Lancashire.

The chief city of the Yorkshire woollen industry is Leeds. Like Manchester, Leeds is the chief receiving and distributing city in the woollen industry. This city is favorably located with regard to coal, water power, and routes that lead across the Pennines. The city of Hull, situated on the Humber River, is the chief port of Yorkshire.

Although the British Isles produce large amounts of wool, the woollen industry has outgrown the home supply. The present demands of the industry call for an import of wool that is three times as large as the home output. Most of the imported wool is obtained from Australia, South Africa, and Argentina.

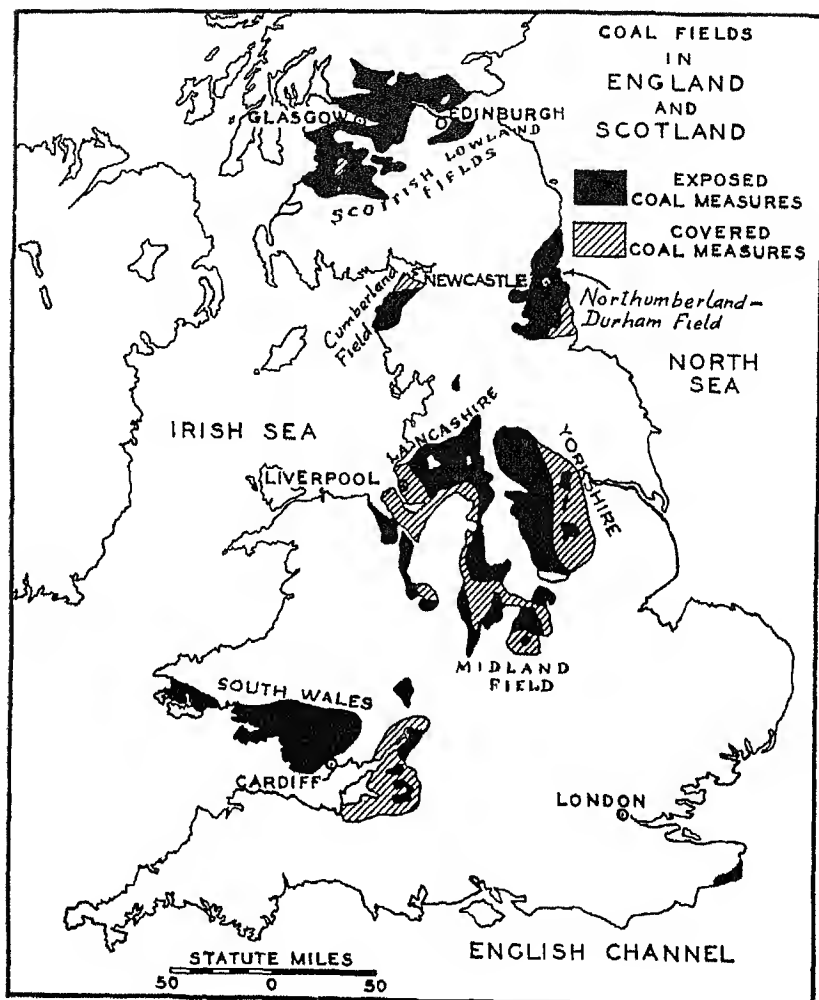
Many different kinds of woolen manufactures enter world trade. Among these are tweeds, worsteds, cashmeres, serges, and flannels. There are also woolen rugs, carpets, and hosiery. Tweeds have long been made in Scotland.

The linen industry. The linen industry of the British Isles has become concentrated mainly in the northern part of Ireland (Illus., p. 407). Here the industry is well established because of (1) local flax, (2) a desirable moist climate, (3) suitable water for bleaching and dyeing, (4) a convenient location for importing coal from the Cumberland and Lancashire coal fields of western England and (5) long experience in the making of linen. But the home output of flax no longer fulfills the requirements for that fiber. Additional quantities are imported from Russia and the Baltic States, together with some especially fine flax fiber from Belgium. Belfast is the chief center of the linen industry.

The iron and steel industry. The iron and steel industry has done much to make Britain an outstanding industrial nation. Without this industry Britain would have been seriously handicapped in the manufacture of ships, textile machinery, agricultural implements, railroad equipment, and many other products for which she has long been noted.

The iron and steel industry has passed through three major stages of development. The first was characterized by the use of charcoal for smelting the ore. Then the industry developed in the scattered districts where iron ore and forests were found in the same general area. The next stage came with the use of coke in smelting the ore. In this stage of development the industry moved to areas that contained good coking coal and iron ore. Since both of these minerals are found in many areas, the iron and steel industry was also widely distributed. Study the illustration on page 410 and notice the distribution of the major coal deposits of the United Kingdom. Much of the British iron ore, however, is low grade, and the high-grade ore has already been used up. It has therefore become profitable to import iron ore from other countries. Hence the third stage of the industry is characterized by the movement of the larger iron and steel works into the coastal areas, where local as well as foreign ore may be used.

At the present time, about two-thirds of the iron and steel plants of the country are located in the coastal regions. The Middlesbrough region is the chief iron-smelting area. It also has the largest output



Coal fields in England and Scotland. The Northumberland-Durham—in which Newcastle is located—and the South Wales fields are the most important in coal export trade.

of steel rails. This region is accessible to the coal fields, and contains reserves of ore. Yet it also depends upon the imports of high-grade Swedish ore. Britain imports approximately one-third to two-fifths of the iron ore used in its iron and steel industry. Most of the ore is obtained from Sweden and Spain.

In general the coastal regions emphasize the manufacture of bulky products, such as pig iron, steel rails, and steel plates for ocean vessels. On the other hand, the inland centers tend to specialize in the manufacture of more expensive products, that is, articles of high value. The inland city of Sheffield is noted for its high-grade metal manufactures, such as scissors, knives, and various other types of cutlery. Here the cutlery industry is established, because of local iron deposits, coal, water power, and millstone grit. The millstone grit is a kind of gritty rock from which grindstones are made. Local water power is used to turn the grindstones, which sharpen the different kinds of cutlery.

Building of ships. Shipbuilding is one of the most important occupations in the coastal regions of Britain. The industry has been developed largely where suitable estuaries (wide lower parts of tidal rivers) penetrate coal and iron ore districts. One-third of all British ships are built in the estuary of the Clyde—that is, in the general area in which Glasgow is located. Important shipbuilding yards are also found at Newcastle and Middlesbrough.

British trade. Britain occupies a leading place in foreign commerce and in the carrying trade of the world. British ships are found on all the ocean routes of the commercial world. "The sun never sets on the Union Jack," and Britain is indeed "mistress of the seas."

The export trade. The export trade means much to the British. Nearly one-third of all the goods produced within the United Kingdom is exported. By way of contrast, we find that the United States exports only one-tenth of all the goods that it produces.

About four-fifths of the British exports consist of manufactured goods. The six leading exports of the United Kingdom, ranked according to value, are cotton goods, iron and steel, machinery, coal, and woolen goods.

Coal is the only imported raw material that is exported in large quantities. British prosperity in trade has depended partly upon its coal exports. These exports have become important for several reasons. Many of the British coal fields are located on or near the coast. (Map opposite.) The coal therefore requires but a short rail haul by land before it reaches exporting ports. The average rail haul is only 25 miles. The coal is of excellent quality. Much of it is classified as smokeless coal. There are abundant reserves, not only capable of meeting local requirements but providing a surplus as well. The British demand large quantities of coal for their

steamships Great numbers of foreign steamships also bring bulky goods, such as raw materials to the British Isles They therefore have cargo space for coal when they leave the country Moreover, the British have established coaling stations throughout the world to supply their own steamships as well as those of foreign countries Britain's leading coal-exporting ports are Cardiff and Newcastle.

The import trade. More than 70 per cent of British import trade consists of industrial raw materials and foodstuffs The six chief imports of the United Kingdom are raw cotton, raw wool, butter, bacon, wheat, and beef. Raw cotton comes mainly from the United States, India, and Egypt Wool is imported from Australia, South Africa, and Argentina Butter and bacon come mainly from Denmark Wheat is shipped from Canada, Argentina, and Australia Argentina and Australia also send beef to the British Isles.

Leading ports. Because of an island location, small area, irregular coastline, and numerous excellent harbors, the British Isles have developed many fine ports Most of the ports also enjoy the advantage of fairly high tides They are not unreasonably high and destructive, but rather enable vessels to navigate farther inland in the lower parts of rivers than would otherwise be possible

The port of London London is the leading port of the British Isles. During normal years it handles about one-third of the foreign trade of the country, and therefore surpasses Liverpool, its closest rival. London's largest trade is with Australia, India, South Africa, Malaya, and other British possessions London is the leading importing port in the British trade with the Orient The railroad system of eastern England converges upon London. The city has therefore become a major distributing center for the imported goods Moreover, it is unsurpassed in entrepôt trade, that is, in the re-export of foreign goods A part of the tea, wool, rubber, tin, and grain purchased from foreign countries is re-exported through London Because of its position opposite the mouth of the Rhine, London is favorably located for trade with the most highly industrialized part of the mainland of Europe A large share of London's re-export trade takes place with that region

The port of Liverpool As the second largest port in the British Isles, Liverpool is the natural port for the great cotton textile region of Lancashire It is located on the western side of Great Britain, and therefore is the chief port in the trade with America, just as London is the chief port in the trade with the Orient. Cotton, grain,

and cattle are leading imports at Liverpool, whereas cotton textiles, textile machinery, and iron and steel products are major exports.

Other important ports. Among the other leading ports of the British Isles one will find Newcastle, Cardiff, Southampton, Glasgow, Belfast, Hull, and Middlesbrough. These cities all have an excellent location. Newcastle is situated on the Tyne River in north-eastern England. It lies in the midst of coal fields, and has large coal exports. Some of the coal is shipped to Scandinavia and the Baltic lands, and some is sent to London. But in coal exports Newcastle is surpassed by Cardiff, the greatest coal-exporting port in the world. It handles the coal of southern Wales. Southampton, located on the southern coast of England, has excellent railway connections with London. Since it possesses the nearest good harbor to London, Southampton handles much of the mail and passenger traffic for that great city. Glasgow is the leading port of Scotland. It is, in fact, the greatest industrial and commercial center of that country. It is situated at the head of ocean navigation on the Firth of Clyde, and is accessible to coal and iron ore. Here shipbuilding is the distinctive industry. Belfast is the chief port of northern Ireland, and is important as a trade center for the linen industry of Ireland. Hull is the great port of the woollen textile region of Yorkshire. Middlesbrough is located between Hull and Newcastle in the east-coast region of England. It is a major iron and steel exporting port and imports iron ore.

FRENCH INDUSTRY AND COMMERCE

Increase of French industry after the World War. Before the World War, France had comparatively few large-scale industries. Industry was made up mainly of small individual units in which quality rather than quantity of output was the chief aim. The large corporation with its mass production was the exception rather than the rule. Then came the World War with its great demand on all industries for quantity as well as quality output. The war also caused the French to realize their shortcomings. Moreover, France obtained certain valuable resources and industries in the former German area of Alsace-Lorraine, which she acquired at the close of the war. This area contains large iron ore and potash reserves as well as textile and chemical industries.

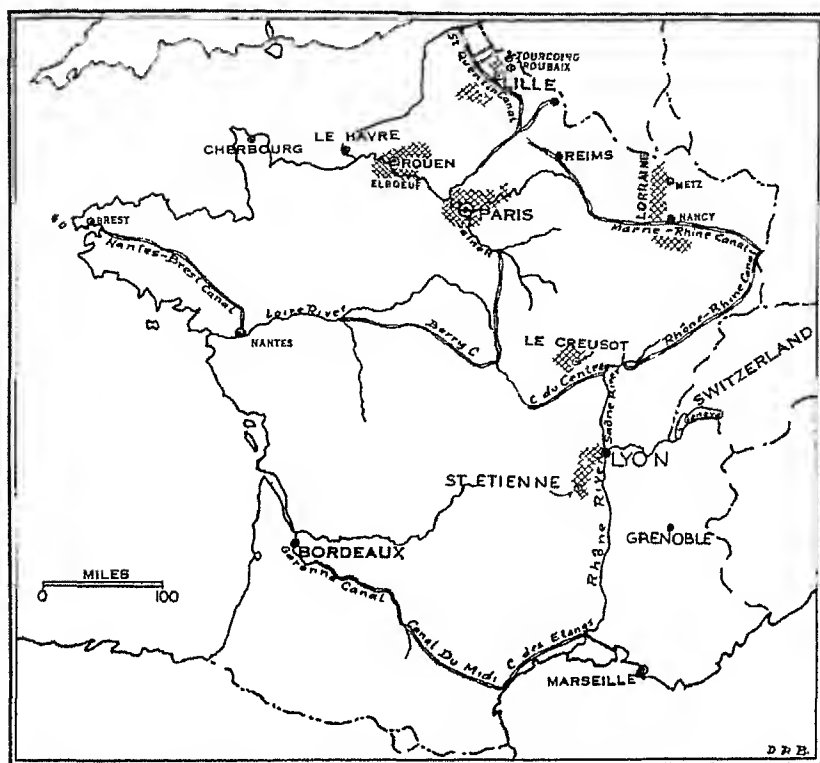
France still contains many small industrial plants, but the country

has added a number of large-scale manufacturing units. France ranks high among the nations of the world in the manufacture of textiles, machinery, iron and steel products, and chemicals. Although industry has made remarkable progress in France, agriculture is still the mainstay of a large part of the population. There is a higher percentage of agricultural workers in France than in any other west-European country. The total value of French manufactures is greatly surpassed both by that of the United States and that of the United Kingdom.

Skill and artistic ability shown in French industry. Unlike Germany and Great Britain, France has comparatively little coal. Before the World War she also had but little iron ore. The country therefore was not blessed with those basic resources that are necessary for the production of large amounts of iron, steel, and machinery. Thus the nation made as good use as possible of its skilled labor. Industries were developed in which skill and artistic ability became important. Even today French industry is noteworthy because of the fineness and the artistic nature of most of its products. In spite of chemical manufactures after the World War, the characteristic French industries still center about the making of high-grade woollens, silks, clothing, perfumes, soaps, and cut glass. The high degree of skill and artistic taste in French industry is nicely reflected in the fashion trade of Paris. The French have shown a marked ability to produce goods of high quality, which find markets throughout the commercial world in spite of their costliness.

Major French industries and their location. Look at the illustration on page 415 and notice the location of the major French manufacturing regions. The various textile industries are located largely in the northern regions. The textile industries have been attracted to these regions because of the northeastern coal fields, the Belgian textiles, and the sheep pastures of the Ardennes Plateau favoring the early development of woollen textiles.

The woollen textile industry. As in the British Isles, so also in France, the woollen textile industry has had a long and important history. The French are noted for the manufacture of high-grade woollens and a great variety of products that contain wool. Among these products are shawls, hosiery, carpets, tapestries, and flannels. Woollen cloth and carpets are manufactured in large quantities in the Lille industrial region of the north, especially in the cities of



Leading industrial districts of France shown by means of shading. Three major textile districts are located in the North—the Lille (with Tourcoing and Roubaix), the Rouen, and the Paris districts. The southern part contains the Lyon-St. Etienne textile district. The Lorraine and the Le Creusot districts are noted for the production of iron and steel. Note also the major inland waterways of France.

Roubaix and Tourcoing (located near Lille). Paris, Reims (about 90 miles northeast of Paris), and Lyon are important producers of wool shawls. Fine flannels, and tapestries are made at Elbeuf and Louviers. The most important woolen industries of France are therefore located mainly in the northern part of the country.

Although France at one time produced enough wool to satisfy the requirements of her wool industries, that is no longer true. France uses more wool than does any other European country, and about three-fourths of it must be imported, largely from Australia and Argentina.

The cotton and linen textiles. Although France produces some

wool at home for her woolen industry, she depends entirely upon foreign countries for her raw cotton. Most of this fiber is obtained from the United States. It is imported mainly through Havre and Dunkirk. Havre serves the Rouen area, which is conveniently located for the importation of English coal. Hence an important cotton textile industry has developed here. Dunkirk serves the Lille region, where local coal is used as power. The industry is also important in the Alsace-Lorraine region. Here much water power is used.

The chief linen industries of France are located in the north, in and around the Lille region, where high-grade flax fiber is obtained from Belgium and from other foreign countries by way of Dunkirk. Here Lille, Cambrai, Roubaix, and Valenciennes are the leading centers of the industry. The linen material known as cambric owes its name to the city of Cambrai.

The silk industry. Like the woolen industry, silk manufacturing is centuries old in France. It is the great industry of the Rhone Valley, with Lyon as the chief center. This city ranks among the leading silk textile centers of the world. Among French cities, St Etienne, situated southwest of Lyon, ranks next in importance. Both of these cities are well supplied with water, and both of them are located in a region that grows some mulberry and raises silk worms. Yet the raw silk industry has suffered greatly because of silkworm diseases and even more because of competition with Japan and China. It is therefore necessary to import more than nine-tenths of all the raw silk that is consumed in France each year.

Iron and steel industry. Since the World War, the iron and steel industry of France has increased rapidly. One of the reasons for the increase was due to the fact that France obtained the former German area of Lorraine, which contains the largest iron ore deposits in Europe. Although these deposits are low in metallic content, they have an excellent location in Europe. Nancy is the chief iron and steel center of this area. The region has very little coal, which is therefore obtained from the near-by Saar Basin and from the Ruhr Valley of Germany.

Since France is poorly supplied with coal she imports large quantities each year for her iron and steel industry. The only major iron- and steel-producing district in France which contains fair quantities of both iron ore and coal is at Le Creusot, which is sometimes called the "Pittsburgh of France." Le Creusot produces

not only iron and steel but also a great variety of products such as machinery, rails, locomotives, guns, cannons, and ammunition

The Lille industrial region is another noteworthy producer of metal products. It is located on the largest coal field of France—the field that extends through central Belgium. Ore is obtained from Belgium. The chief products of the region are locomotives and machinery.

Transportation. In France commodities and passengers are transported by various means. In general the bulky goods, such as gravel, sand, iron, and coal are transported by waterways and railroad. The country contains more than 9,000 miles of waterways. The most extensive use is made of the waterways of the north and northeast. Unfortunately in the south of France the Rhone Valley is but little used, except for local transportation south of Lyon, because of the numerous rapids in the southern part of that river. Although considerable use is made of the waterways of France, nearly eight times as much freight is carried on the railways. Paris is the great center of the railway system.

World commerce of France. In value of foreign trade France normally ranks fourth among the nations of the world. It is surpassed by the United Kingdom, the United States, and Germany.

With a coastline on the Atlantic and on the Mediterranean, France occupies an excellent location for foreign trade, yet the country is much more self-sufficient than Great Britain because of its varied resources. It has maintained an important agricultural industry in spite of the development of manufactures. It produces most of the food required by its population, whereas Great Britain obtains her foodstuffs largely from other countries. Yet the trade list of France reflects the condition of an industrial nation. As in Great Britain, raw materials and foodstuffs are most important among the imports. Coal, raw cotton and wool, wheat, oil seeds, and wine are leading items of the import trade. Strange as it may seem, France, the largest wine-making country in the world, imports more wine than she exports. The consumption of wine is tremendous. Among the leading items of export are the wool, silk, and cotton textiles, iron and steel, metal manufactures, machinery, and chemicals. The last three items have become important chiefly since the World War. In addition, France exports many products that reflect skill and artistic ability. These include fine gowns, laces, tapestries, perfumes, soaps, cut glass, and pottery.

The chief ports Paris, the capital and largest city of France, is located on the navigable Seine River. But the city can be reached only by vessels that have a depth (below the water line) of only 10 feet. Large ocean vessels therefore stop at Cherbourg, Havre, and Rouen, which may be considered ports of Paris. Just as Southampton handles much of the passenger traffic for the port of London, so Cherbourg takes care of a large share of the American passenger traffic of Paris. Havre and Rouen handle a great variety of commodities for Paris.

Farther to the north on the Strait of Dover lies Dunkirk, a port that serves the Lille industrial region of northern France. The harbor of Dunkirk is well adapted to large ocean vessels.

Bordeaux is located in the midst of the great wine-producing region of southwestern France. It exports that product, and receives many different kinds of commodities to be distributed in various parts of France. Its transportation contacts with other regions make it an important distributing center.

Marseille is also an important distributing center. It is located on the Mediterranean Sea and near the mouth of the Rhone. It therefore has a large Oriental and African trade. Among its imports are oil seeds, oil, raw silk, and coffee. Oil and oil seeds are used largely in the soap and candle manufactures of Marseille. This port also serves the city of Lyon and receives large shipments of raw silk from Japan and China.

GERMANY

Rapid industrial growth. Germany is a comparatively young industrial nation. The rise from being a land of farmers to being one of the foremost nations in the commercial world has taken place mainly during the last half century. The German Empire was not formed until 1871, and even in the eighties of last century Germany was largely an agricultural nation. Then followed a period of splendid scientific achievements. Science was applied in the use of resources, and industry responded with tremendous increases.

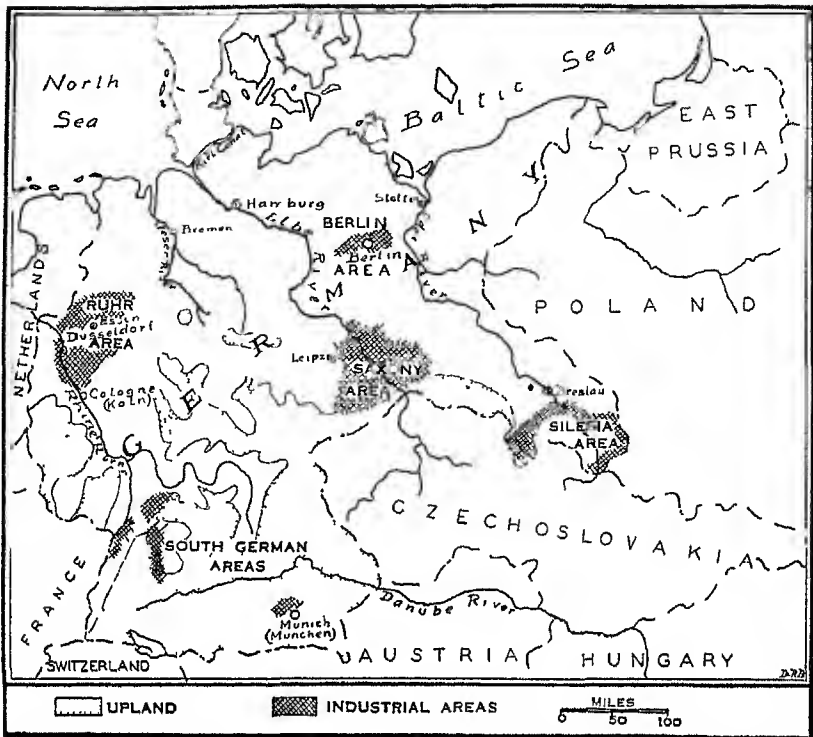
Factors that aided industrial development. Many factors contributed to the industrial and commercial growth of Germany. The country contains valuable natural resources, such as coal, water power, varied soils, forests, and metals. The people have made good use of these resources. With the aid of science many new uses have

been found for various natural resources. The country contains an intelligent and hard-working population. An excellent system of education has aided not only the people in general, but scientific development in particular. The government has also contributed much to the industrial growth by introducing measures that aided manufacturing.

Germany's iron and steel industry. A nation's iron and steel industry is sometimes taken as a measure of its industrial strength. On that basis, Germany is one of the foremost of industrial nations, since it is normally one of the leading producers of pig iron and steel. This industry made rapid progress in Germany because of abundant supplies of good coking coal, large reserves of iron ore, an industrious population, large domestic markets, and an excellent system of transportation. The Ruhr Coal Field is considered the richest in Europe. Considerable quantities of iron ore are found about 50 miles south of the Ruhr Coal Field, but the lost ore fields of Lorraine are the largest in Europe. They played an important part in the development of Germany's iron and steel industry during the pre-war period. Ore is also obtained near the Saxony and the Silesian coal fields, but at present there is much imported ore, notably from Sweden and Spain. The Swedish ore has a metallic content that is much higher than the Lorraine ore. Large quantities of Swedish ore move up the Elbe to the Saxony District, but the Ruhr and Silesian districts also depend in part upon foreign ores. The Ruhr District is the leading producer of iron and steel in Germany.

With the loss of Lorraine and Luxembourg iron ore and Saar coal (until it was returned by the plebiscite in 1935), Germany's iron and steel output declined. A further blow was received with the coming of the depression in 1929; until France finally surpassed Germany in the output of pig iron. Germany, however, maintained leadership among European nations in the output of steel. But the production of pig iron has increased steadily from a low point that was reached in 1932. Thus by 1934 Germany was once more Europe's leading producer of pig iron and steel. Among the nations of the world, only the United States manufactures more pig iron and steel than is made in Germany. Russia has become a close competitor with Germany for European leadership in this industry.

Machinery manufacture. More than nine-tenths of Germany's pig iron and steel is consumed at home. The greater part is used in the making of machinery. In the output of electrical machinery,



Leading industrial areas of Germany The highlands above 1,000 feet elevation are shown by means of dots, and are most extensive in the southern part of Germany

Germany leads all of Europe In the manufacture of machinery other than electrical, she competes with the United Kingdom

The heavy machinery industry of Germany is located chiefly in the Ruhr District, near the sources of raw materials (Map above) The manufacture of textile machinery takes place at and near most of the textile centers, located chiefly in the Ruhr District, near the sources of raw materials The manufacture of textile machinery takes place at and near most of the textile centers located in Ruhr, Saxony, and Silesia Locomotives are made at major railway centers, such as Berlin and Cologne (Koln) The manufacture of high-grade electrical equipment and scientific instruments is also noteworthy. The scientific instruments are sometimes made at a distance from the source of raw materials. Thus Munich (München)

has become one of the leading producers of such commodities. Germany occupies an important place among the nations of the world in the export of scientific instruments and optical goods.

The textile industries. In importance the textile industries of Germany are surpassed only by the metal manufactures. Among European nations Germany rivals France in the making of textiles. Both of these nations are surpassed by Great Britain. Cotton manufacturing is the most important branch of Germany's textile industry. The loss of Alsace rendered a severe blow to the German textile industry, since Alsace was one of the leading regions in the making of cotton textiles. But since the World War many new textile mills have been established within Germany and the prewar position has been reached in this industry. The chief districts of cotton textile manufacturing are the valleys of the Ruhr and Rhine, Saxony, and the metropolitan area of Berlin (Map opposite). Woolen manufactures take place largely in the Rhine Valley, Saxony, and Silesia. In Saxony and Silesia the industry used large amounts of local wool. But the greater part of the raw wool consumed by this industry must be imported. Silk manufacturing takes place chiefly at Krefeld, located in the area of the Lower Rhine (near the Ruhr). Krefeld competes with Lyon, France, and Milan (Milano), Italy.

The chemical industries. The tremendous development of the chemical industries of Germany has been associated with the ever-increasing application of science in the use of raw materials. It has also been associated with the development of education and research. It is through the chemical industries that Germany has made some of her most distinctive contributions to modern civilization. Although Germany is now surpassed by the United States in the total output of chemicals (in value), it is the leading nation in the export of these commodities.

Among the most important of Germany's chemicals are the coal-tar dyes. Since these are made partly from by-products of coal, they are manufactured chiefly in the valleys of the Ruhr and the Rhine. In the making of coal-tar dyes Germany had a world monopoly prior to the World War. But the wartime needs of the United States forced production within our own country, so that now we surpass Germany in the total output of such chemicals.

Other important branches of chemical manufacturing in Germany include the making of industrial chemicals, such as bleaching com-

pounds, sodas, and acids; the manufacture of fertilizers, soap-making; and drug-manufacturing.

In the manufacture of fertilizers Germany occupies a leading position in Europe. The industry is centered mainly in Saxony, where it draws upon the world's largest reserves of potash. Strassfurt has become one of Germany's leading chemical centers, chiefly because of its location in the area of potash reserves. A complete or well-balanced commercial fertilizer requires not only potash but also nitrate and phosphate. Nitrate was formerly obtained from the sodium nitrate fields of northern Chile. But at present most of the nitrate required for Germany's fertilizer industry is produced at home. Some of it is taken from the air (as in Norway), and some is obtained from ammonium sulphate, a by-product obtained in the coking process. The chief reserves of phosphate are found in northwestern Africa, chiefly Tunis, Algeria, and Morocco, and in the United States. Germany, however, obtains large quantities from the blast furnaces, since the iron ore is high in phosphorus. This phosphorus is obtained from the slag (otherwise waste material) that is taken from the blast furnaces in the process of manufacturing pig iron. Leading centers of fertilizer manufacturing are Strassfurt, and the general area of Leipzig.

Other noteworthy chemical industries include the making of gasoline from low-grade coal and alcohol from potatoes. Germany lacks petroleum resources, and these chemical developments help solve the fuel problem of the country.

An excellent system of transportation. Germany has a splendid system of railway, road, river, and canal transportation. Much use is made of the waterways. By means of the Rhine River, small ocean vessels carry much grain and ore. Vessels of 400-ton capacity reach the Franco-German boundary zone, where canals lead into France. But the Rhine is not navigable for large ocean steamers beyond Rotterdam. Large ocean vessels ascend the Weser River for a distance of 50 miles to Bremen, and the Elbe River takes large steamers as far as Hamburg. Numerous canals connect the major rivers. The larger rivers flow northward to the North Sea and the Baltic. East-west trending canals connect the Rhine with the Elbe, the Oder, and even with the Vistula in Poland. Thus the Prussian Plain is well served with waterways. A large part of Berlin's trade is by means of water. Canals also extend from the Rhine into Belgium and the Netherlands.

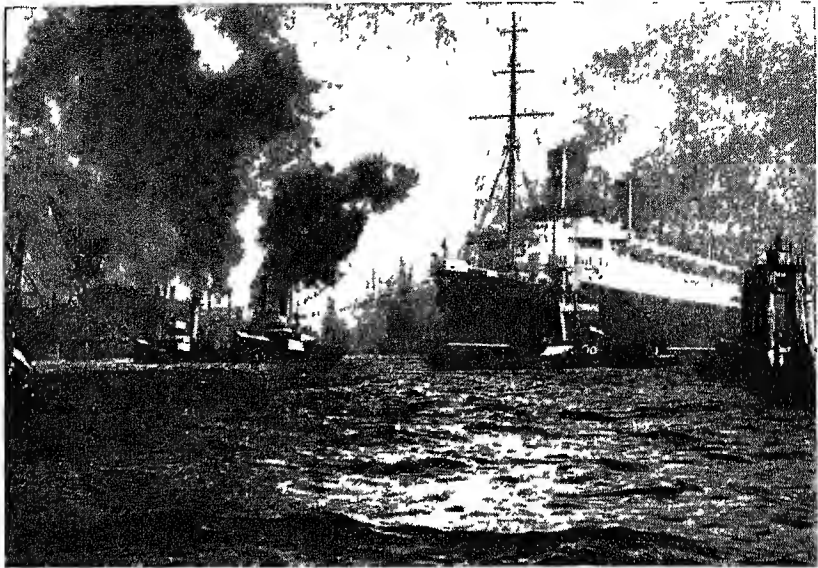
The railway system of Germany is well developed. The network of rail lines is closest in the industrial districts. Berlin is a major rail center. Lines from all sides converge upon this city.

The foreign trade and chief ports. Germany ranks third among the nations of the world in foreign trade, being surpassed only by the United Kingdom and the United States. The imports consist chiefly of industrial raw materials and foods. Leading items of the import trade are cotton, wool, fruits and nuts, mineral oils, oil seeds, timber and lumber, iron ore, coffee, and tobacco. On the other hand, the exports consist chiefly of finished products or manufactures. A notable exception to this rule is the large export of coal, a condition comparable to that found in the United Kingdom. Among the leading items of the export trade one finds machinery, iron and steel, chemicals, coal, paints and varnishes, and glassware.

Germany trades largely with other European countries and the United States. Cotton and mineral oils constitute the leading imports from the United States, whereas chemicals are the leading items of export to our country. The direction of commercial expansion is largely eastward and southeastward through the basin of the Danube, as it was before the World War. Russia to the east and the Danube countries to the southeast produce industrial raw materials and foodstuffs. Russia has a surplus of grain, flax, and mineral oils, Rumania has grain and mineral oils. Germany is deficient in these materials and has manufactured goods to offer in exchange for them.

The chief ports. Hamburg is Germany's leading port. (Illus., p. 424.) It is one of the five foremost ports of the world. During normal times its volume of trade is surpassed only by that of New York, London, and Liverpool. Located in the lower part of the Elbe Valley, Hamburg handles much of the trade of northern Germany and also a large share of Czechoslovakia's foreign commerce. A small port near the sea, called Cuxhaven, has become the outport of Hamburg. It is used by the larger ocean vessels, which fear the shallower waters of the Elbe estuary.

Bremen is Germany's second port. It is located on the Weser River at a distance of 50 miles from the sea. It is Germany's leading port in handling cotton, tobacco, and rice imports. But it lacks the extensive and productive hinterland (back country) which characterizes the port of Hamburg. The Weser is one of the less important



Port of Hamburg, one of the great ports of the world (Courtesy German Railroads Information office, New York)

rivers of Germany from the standpoint of navigation. This river basin contains a large amount of unproductive land. Like Hamburg, Bremen is served by an outpost, which is Bremerhaven.

MANUFACTURING AND COMMERCE OF BELGIUM, THE NETHERLANDS, AND DENMARK

Industrial importance. Manufacturing is most important in the southernmost of the small countries, Belgium, the Netherlands, and Denmark, and least important in the northern one. The Netherlands occupies an intermediate position between industrial Belgium and agricultural Denmark. But in foreign trade the Netherlands and Belgium are close rivals. All three nations have a high trade per capita.

Belgium's industry and commerce. Belgium is one of the most intensely industrialized nations of Europe. One of the reasons for this development of industry is the mineral wealth of the country. Belgium is much better endowed with minerals than are the Netherlands and Denmark. In addition, the excellent location,

splendid transportation facilities, and abundance of skilled labor all have aided the development of industries

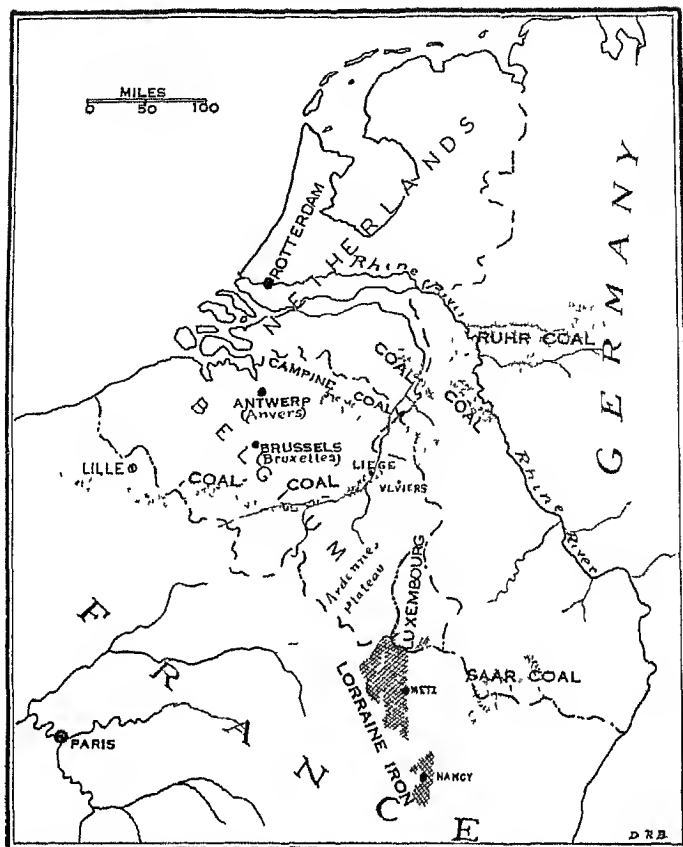
The mineral industries As in Germany, the most important industrial activities of Belgium center about the making of pig iron, steel, and machinery. Such industries have been developed mainly in the great coal field of Belgium which stretches from northern France throughout the central part of the country (Illus., p. 426). Iron ore and limestone are also found in this region, but the output of iron ore is far from sufficient. Belgium must import ore, chiefly from Luxembourg. The chief center of the steel industries is Liège and its suburbs. Find Liège in the map on the next page. Most of the steel is used in the manufacture of machinery, firearms, railway equipment, and general hardware, especially wire and nails. Approximately three-fourths of the steel products are exported.

Belgium also contains other important industrial minerals, such as zinc, copper, and lead. One of the richest zinc districts in Europe is located near Veviers, a short distance to the southeast of Liège (Illus., p. 426). Between Liège and Veviers copper and lead are mined. Since these centers are located in the eastern end of Belgium's great coal field, there is ample fuel for smelting and refining the metals.

The textile industries. The textile industries follow the iron and steel trades in importance. During the Middle Ages, the Belgian Plain, notably Flanders, was one of the distinctive districts in the manufacture of woolens. From this region many Flemish weavers migrated to England. The start of textile manufacturing in the United Kingdom was due in part to the influx of these skilled Flemish workers. The Belgian Plain is now better known for its linen manufactures than for woolens. In this district several centers specialize in the making of fine lace. Some of the flax fiber that is used in the linen industry is produced locally, but the greater amount is imported. High-grade flax is obtained from the Netherlands, and a somewhat coarser variety is imported from Russia.

The lowlands of Belgium also manufacture large quantities of cotton textiles. All the raw cotton must be imported, cotton being one of the important items of the import trade. Large quantities of cotton textiles are produced for Belgium's great Congo colony in Africa.

Woolens are still made in the lowlands of Flanders, but the



Major coal and iron deposits in France, Belgium, the Netherlands, and western Germany. Here is one of the foremost industrial areas in the world.

industry has also moved into the region of the Ardennes Plateau, where some wool is produced locally. In addition, large quantities of wool must be imported.

Trade and trade centers. Belgium's foreign trade, like that of Germany, consists largely of the import of industrial raw materials and foodstuffs and the export of finished products. Of all items in the total foreign trade of Belgium, the iron and steel exports are by far the most important.

Antwerp (Anvers), Belgium, is one of the leading trade centers of Europe. It is located at the head of the estuary of the Scheldt

River Deep canals connect Antwerp with the Seine, the Meuse, and the Rhine. Antwerp handles many important items of export, such as iron and steel, machinery, and textiles. It has become a rival of Amsterdam in the diamond-cutting industry. Moreover, it is the world's leading ivory market, receiving large shipments of ivory from the Belgian Congo.

Brussels (Bruxelles) is Belgium's capital and largest city. It also handles much trade. Although it is located within the center of Belgium's lowland, canal transportation connects it with the sea, and it is reached by ocean vessels.

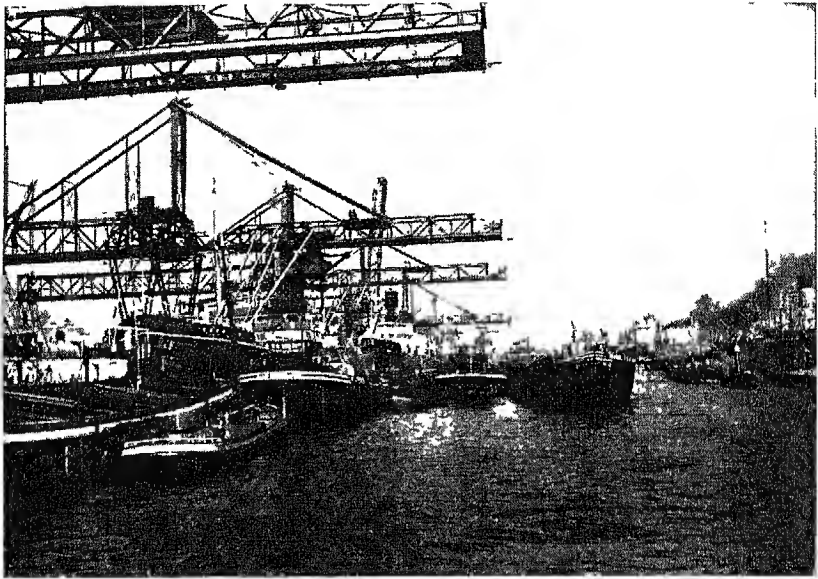
Industry and commerce of the Netherlands. The Netherlands (also called "Holland," from the western province of that name) is handicapped because of the scarcity of timber, building stones, water power, and minerals. The only minerals of importance in the Netherlands are some coal in Limburg province (southeastern Netherlands) and clay from which glazed earthenware is manufactured. Yet the country is favorably located and receives large amounts of raw material by means of cheap ocean and river transportation. Coal and iron are obtained from Britain on the one hand and by means of the Rhine River on the other. Many tropical products are received from Dutch colonial possessions in the East Indies.

The manufacture of food products has long been an important activity in the Netherlands. This industry is based on the large domestic output of agricultural products and imports of tropical foods from its possessions in the East Indies. The making of milk chocolate illustrates this point. In the manufacture of that commodity one will find imported cacao and sugar and locally produced milk. The making of butter, cheese, and condensed milk is based on the important dairying industry of the Netherlands.

Other major industries consist of the manufacture of textiles, shipbuilding, and the cutting and polishing of diamonds. The diamond industry is centered at Amsterdam.

The Netherlands has a large foreign trade per capita and per square mile. But much of the foreign trade consists of the import and re-export of East Indian products. There is also a large transit trade in products moving into and out of the Rhine Basin.

The chief trade centers are Rotterdam and Amsterdam. Rotterdam has a more favorable location as compared with Amsterdam for the trade of the Rhine Basin on the one hand and the English Channel on the other. Chiefly because of its position at the mouth



A section of the port of Rotterdam, one of the foremost ports of the world (Courtesy Netherlands Railways)

of the Rhine, it has become one of the great ports of the world (Picture above) Like Antwerp, it is an important transfer point. But Antwerp is comparatively more important in handling commodities that are distributed or received by rail, whereas Rotterdam handles a large part of the water-borne traffic of the Rhine. Amsterdam, the capital and largest city of the Netherlands, is connected with the North Sea by means of the North Sea Canal and with the Rhine River by means of the Rhine Canal. This city is especially important in the colonial trade, and in the diamond-cutting industry it has a world reputation.

Denmark's industry and commerce. Like the Netherlands, Denmark lacks water power, metals, and mineral fuels. It has some low-grade subbituminous coal but the reserves are much smaller than even those of the Netherlands. Like the Netherlands, Denmark has long been important in the manufacture of local foodstuffs, such as butter and cheese.

The foreign trade consists largely of the export of foodstuffs, such as bacon, butter, and eggs. On the other hand, leading imports include iron and steel, coal, oil cake and meal (for feed), and corn.

THE HIGHLAND COUNTRIES OF
WESTERN EUROPE

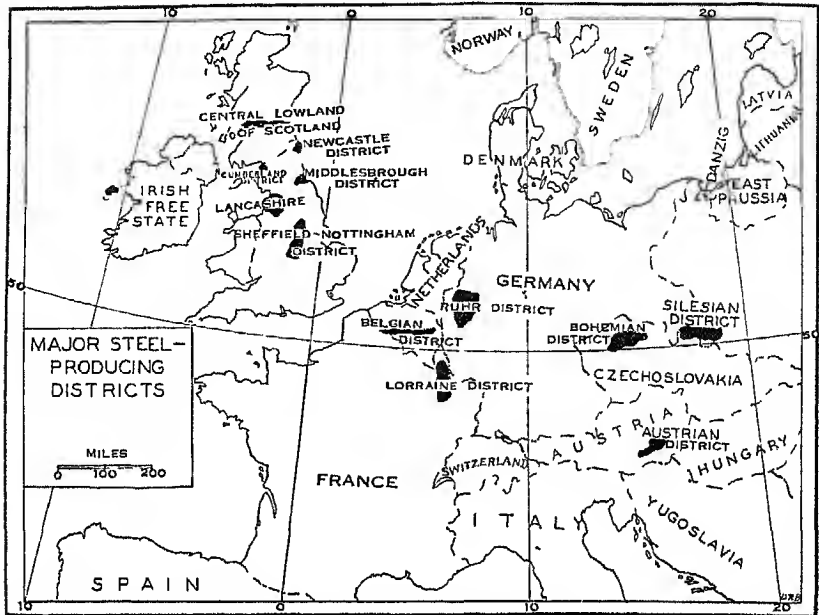
Manufacturing varies in importance from place to place. Industrial life is not equally important in all the upland countries of western Europe. In general a lower percentage of the working population is engaged in manufacturing in the eastern parts of this area than in the western part. Switzerland and western Czechoslovakia show the highest percentages of industrial workers, whereas Hungary has the lowest percentage. Less than 19 per cent of the working population in Hungary is engaged in manufacturing, as compared with 44 per cent in Switzerland. This remarkable industrial development in Switzerland has taken place in the face of serious handicaps. The country lacks important raw materials and occupies a landlocked position in Europe. Yet its manufactured products are sent to all parts of the world.

In Czechoslovakia modern manufacturing is concentrated largely in the western part of the country. As compared with eastern Czechoslovakia, that region contains the larger amount of good coal, a greater variety of industrial raw materials, a better trained and more skilled industrial population, and a more favorable location for trade.

The great importance of agriculture in Hungary is reflected in the country's most characteristic industry—flour milling. Budapest, the great milling city of Hungary, is sometimes called "the Minneapolis of Europe." Unfortunately, Hungary is poorly equipped with minerals. She lost most of her coal and iron ore after the World War, when Czechoslovakia became an independent nation.

Mineral industries. The largest coal and iron reserves of these upland countries are found in Czechoslovakia and Austria. Switzerland and Hungary are practically lacking in these basic minerals. With the subdivision of the old Austro-Hungarian Monarchy, Czechoslovakia retained the lion's share of the coal and iron. It has been estimated that Czechoslovakia contains more than four-fifths of the coal and about three-fifths of the iron ore found in the old Austro-Hungarian Monarchy. Iron and steel industries are therefore well developed in that country, notably in the western part.

There is, however, an important manufacture of mineral products even in areas where coal is lacking. For example, Switzerland's machinery manufactures are quite important, notably electrical

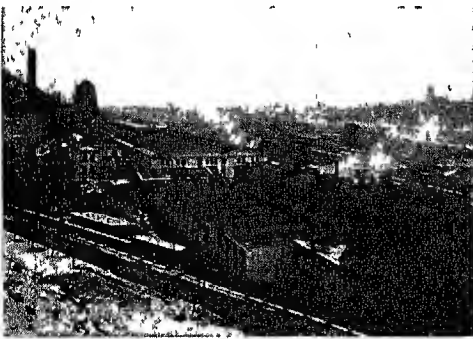


Major steel-producing districts in Europe (The Irish Free State has officially been called Ireland since December, 1937)

machines for hydroelectric power development. Yet the country is almost entirely deficient in industrial minerals. She must import mineral products—steel, copper, etc.—that are used in the manufacture of electrical machinery. Advantage is taken of the large water-power resources, the favorable geographic location, and the

intelligent skilled population. In spite of the shortage of coal, the metal industries of Austria constitute the leading group of manufactures in that country.

The textile industries. Textile manufactures have sprung up in a number of places in the highland countries. In many districts, notably in Switzer-



Consolidated machine shops in Prague (Courtesy Czechoslovakia State Railways.)

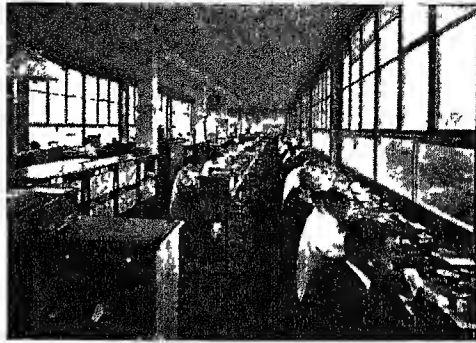
land and Austria, emphasis is placed on the finer textiles, such as fine cotton goods, laces, fine woollens, and silk goods. Among European nations, Switzerland follows France, Italy, and Germany in the importance of its silk industry.

Household industries.

The manufacture of various commodities in the

homes is a characteristic feature of many of the upland districts of western Europe. Embroideries, toys, clocks, and pottery have long been made in these areas, even by the agricultural people during their spare time. Have you ever purchased an item on which appeared the words "made in Czechoslovakia"? Have you seen a clock or watch that was made in Switzerland?

Switzerland's shift to the factory system. Since Switzerland lacks the abundant reserves of coal, iron ore, and other minerals which favor large-scale manufacturing, the factory system made but little progress in that country prior to the period of the World War. But that period brought an active demand and high prices for all types of goods. Many factories were built, especially at water-power sites. Watches and clocks, formerly made by hand in the households,



Interior of a Swiss watch-making factory
(Courtesy Swiss Natl. Tourist Office)



The upland countries of western Europe and their neighbors. Note that these countries lack seacoasts.

became the products of machine industry. Many commodities are still made in households, but their total value is greatly surpassed by factory-made products.

Transportation and commerce. Look at the map at bottom of page 431 and you will notice that these four countries of Europe lack seacoasts. They are all landlocked nations. River transportation takes place by means of the Danube from Germany through Austria and Hungary to the Black Sea. Czechoslovakia uses the Elbe River Valley and exports large amounts of goods via Hamburg, Germany. Basel, located in northern Switzerland, lies at the head of navigation on the Rhine River.

The greater part of the foreign trade of Austria, Hungary, and Czechoslovakia is with one another and with Germany. For example, Austria trades chiefly with Czechoslovakia, Hungary, and Germany, while Hungary and Czechoslovakia trade largely with Germany and Austria. Switzerland, on the other hand, trades mainly with Germany and France. In addition, a large part of the foreign trade of these countries passes through neighboring nations. In other words, the transit trade is important.

QUESTIONS AND EXERCISES

- 1 Give reasons why western Europe has become an outstanding region in (a) manufacturing and (b) commerce.
- 2 What are the distinguishing characteristics of the commerce of western Europe?
- 3 Why has Great Britain become a powerful industrial and commercial nation?
- 4 Give reasons why the British cotton textile industry has been developed largely west of the Pennine Mountains, whereas the woolen industry is centered mainly in Yorkshire.
- 5 Of what importance is foreign trade to the United Kingdom?
- 6 Why have London and Liverpool become great world ports? Give reasons.
- 7 What are the characteristics of the French manufacturing industry?
- 8 Name the woolen and cotton textile manufacturing regions of France. Where are the silk-producing districts located? Why?
- 9 What factors aided the industrial development of Germany?
- 10 Germany is Europe's leading producer of fertilizers. How does she obtain nitrate? Potash? Phosphate?

- 11 List the leading items of Germany's export and import trade. Why is there a tendency for Germany's commercial expansion to extend eastward and southeastward (with Russia and the countries of the Danube Basin)?
- 12 Compare Belgium, the Netherlands, and Denmark in the extent to which they have become industrialized.
- 13 Why has Rotterdam become one of the great ports of the world?
- 14 Explain the importance of mineral industries in Czechoslovakia.
- 15 What are the advantages and disadvantages in Switzerland with respect to industrial development?

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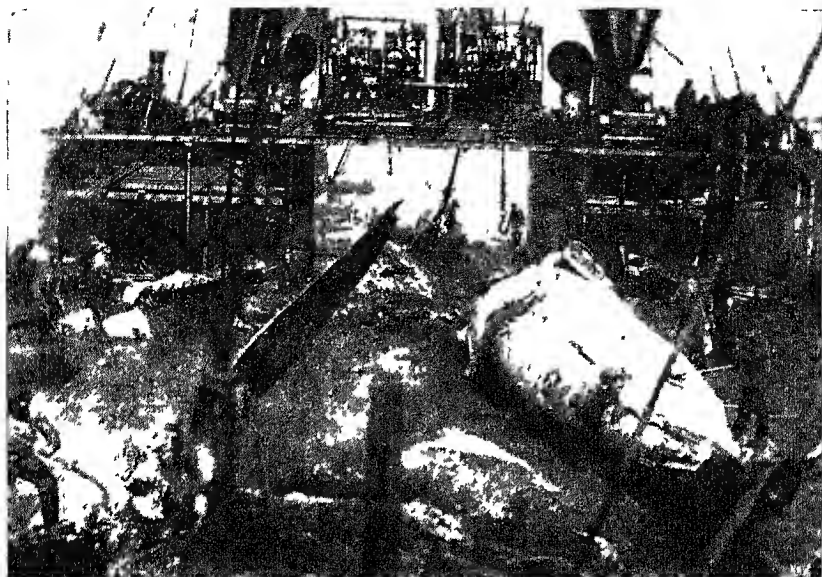
NORTHERN EUROPE—THE SCANDINAVIAN PENINSULA, FINLAND, AND THE BALTIC STATES

THE SCANDINAVIAN PENINSULA

Contributions to civilization Although the Scandinavian Peninsula suffers from physical difficulties, such as vast stretches of unproductive rocky wastes, its people have a high standard of life, and they have made noteworthy contributions in various fields of human activity. A number of famous explorers have come from this northern area. In literature, science, and the arts, the Scandinavian Peninsula has contributed leaders such as Ibsen, Bjornson, Grieg, Amundsen, Nansen, and Nobel. Its people have made noteworthy advances in the use of natural resources, chiefly water power, products of the sea, timber, and iron. Norway was the first country to manufacture nitrate from the air on a commercial scale, and she possesses the last large whaling fleet of the world (Illus., p. 435). Both Norway and Sweden are among the leading nations of the world in the export of wood products, and Sweden has long been noted for her production of high-grade steel. But the peninsula is poorly equipped with some natural resources, such as coal, copper, lead, zinc, petroleum, and natural gas, and it contains vast stretches of cold, barren, rugged, and unproductive highland. It has therefore been unable to support a large population, and since the days of the Vikings, Scandinavia has been an exporter of men.

Population and distribution. Because of physical handicaps, the Scandinavian Peninsula as a whole has a sparse population (Illus., p. 436). With 24 people to the square mile, Norway has the lowest population density of any country in Europe, and Sweden has a density of only 39. These figures contrast strikingly with those of Belgium and the Netherlands, where the population density is 639 to the square mile (735 in Belgium).

For the Scandinavian Peninsula as a whole, the population density is greatest in the southern part and in the coastal areas, where the topography is gentle, the soil deep and fertile, the climate least severe, and where good sheltered harbors give an outlet to the fishing grounds of the North Sea and an outlet to the commerce of the

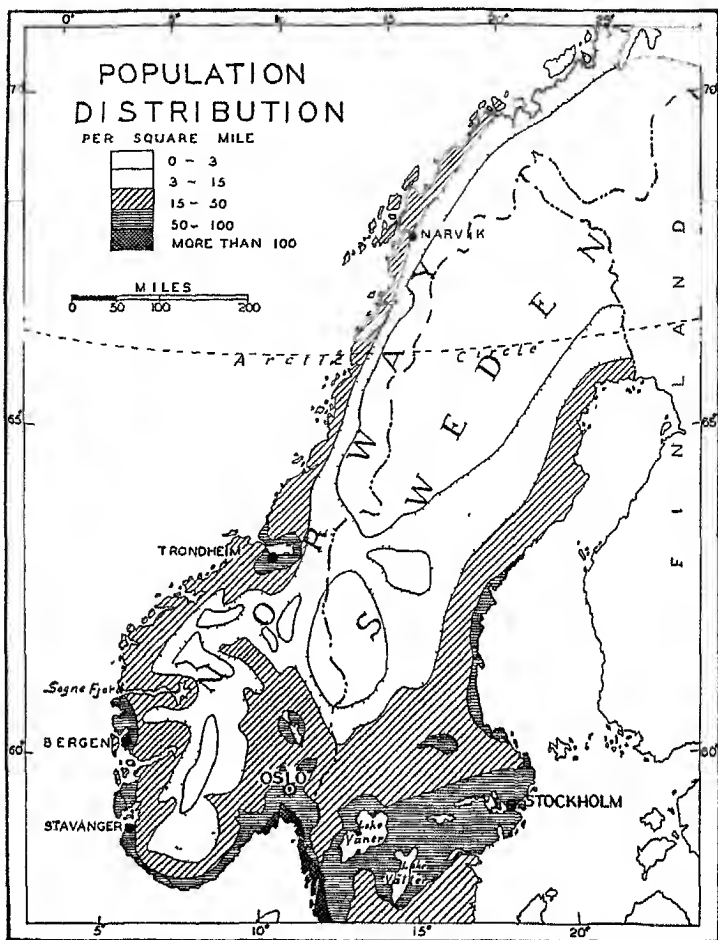


A whale in the process of being cut up aboard a floating factory (Photo by Bryns, Oslo, courtesy U S Bureau of Foreign and Domestic Commerce)

world (Illus, p 436.) Thus in Norway the greater number of people are found in the lowlands adjacent to Oslo, the capital, and along the south and west coasts. In these areas agriculture, manufacturing, and commerce are best developed. In Sweden most of the people live in the southern and south-central lowlands, where the climate and relief of the land have favored the development of agriculture.

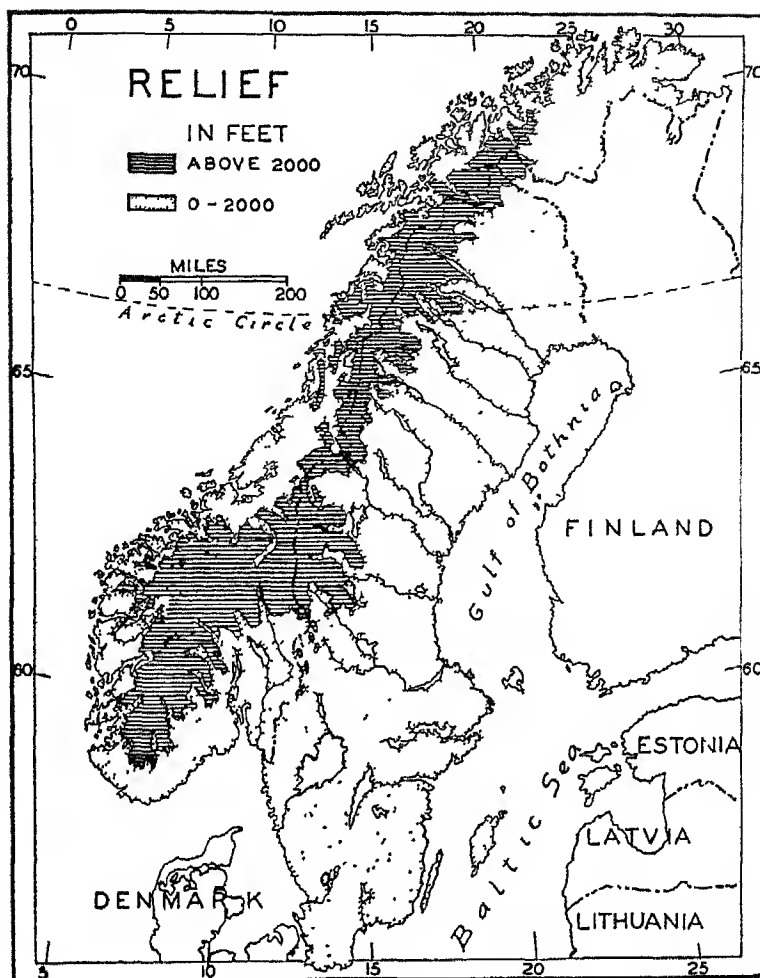
Norway and Sweden compared and contrasted. The two countries which make up the Scandinavian Peninsula differ in certain important ways. The mountainous backbone of the peninsula is located nearer the west coast than the east. (Illus., p. 437.) Thus Norway is mainly mountainous. Along most of the west coast mountainous cliffs border the sea. The coast is rugged, and the few valleys contain but little level land. In many places the small fishing villages seem to hang precariously to the steep rugged mountainsides. Sweden, on the other hand, consists chiefly of lowland.

The north-south trending backbone of Scandinavia also affects the climate of the two countries. It shelters Norway from the cold winds that blow at times during winter from the continental land



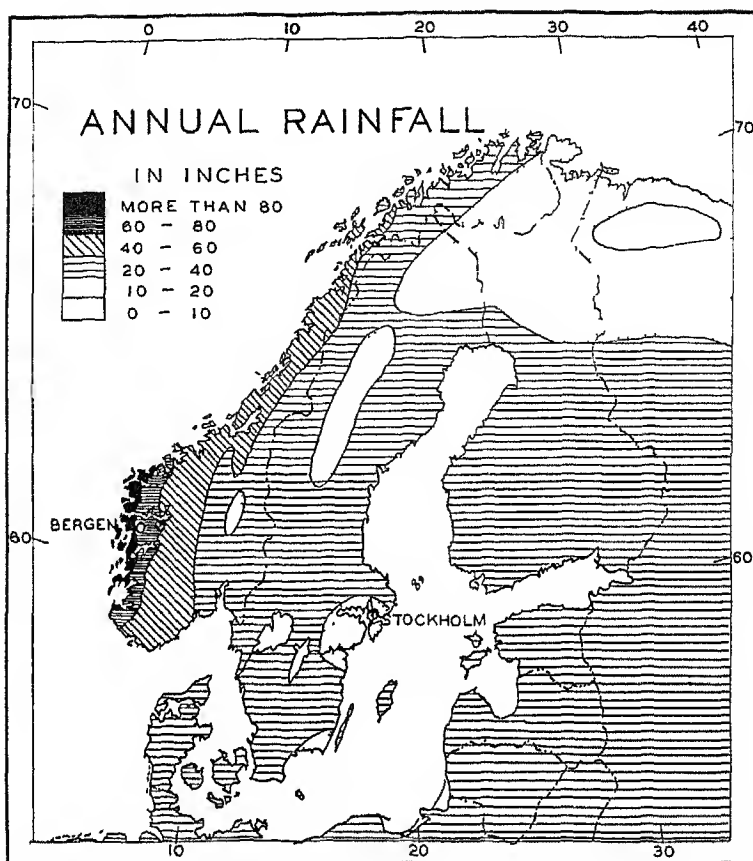
Distribution of population in Norway and Sweden. Note the concentration of people in the southern and coastal regions, and the sparsely populated interior highlands.

mass lying to the east. Norway is exposed to the moderating influence of the westerly winds that blow from the warm North Atlantic drift. Thus the ports of Norway, even in the far north within the Arctic Circle, are ice-free the year round, while those of Sweden are closed by ice for several months of the year. In addition, Norway's direct exposure to the westerly winds means a greater rainfall, especially in the southwestern coastal districts of



Relief map of the Scandinavian Peninsula

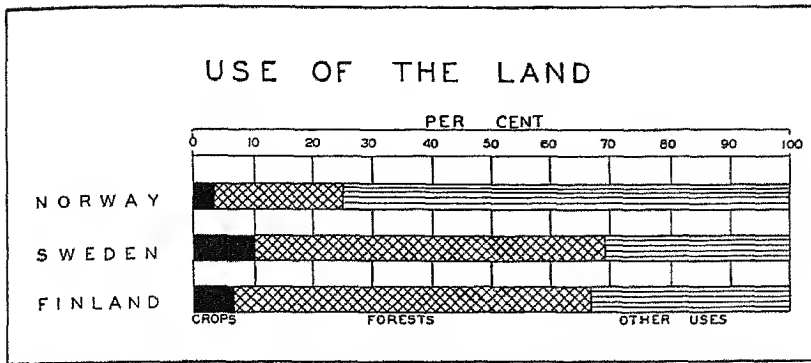
the country. Thus Bergen, Norway, has an average yearly precipitation of 78 inches, and sometimes it rains or drizzles for days together. Gloomy weather and overcast skies are the rule, while on the east side of the mountains, at Stockholm, Sweden, the annual rainfall is only 19 inches, and bright, sunny weather is not uncommon (Illus, p. 438.) However, 19 inches of precipitation is a plentiful supply in these northern latitudes, where evaporation is



The average annual rainfall in the Scandinavian Peninsula, Finland, and the Baltic States. Note the decrease in precipitation from west to east in the Scandinavian Peninsula.

not very rapid. Rain falls at all seasons throughout the peninsula; but in Norway the maximum occurs during the fall and winter months, while most of Sweden receives the larger amount during summer, when it is of greatest value for agricultural purposes.

Differences in position, climate, and relief have caused differences between Norway and Sweden in the use of land and resources. Thus the high latitude and high altitude make a large part of Norway too cold even for the growth of trees. Only 21.5 per cent of her land is forest-covered, as compared with 59 per cent in Sweden. (Chart, p. 439) Moreover, four times as much cultivated land is found in



The use of the land in Norway, Sweden, and Finland. Note the higher percentage of crop land, as well as forest land, in Sweden as compared with Norway.

Sweden as in Norway. In both countries, hay, oats, barley, potatoes, and rye are important crops, but Sweden also has a large amount of land in wheat. As compared with Norway, Sweden has a drier harvest season and more extensive areas of level land suitable for wheat culture. On the other hand, Norway's long indented coastline and ice-free ports have favored a remarkable development of maritime activities.

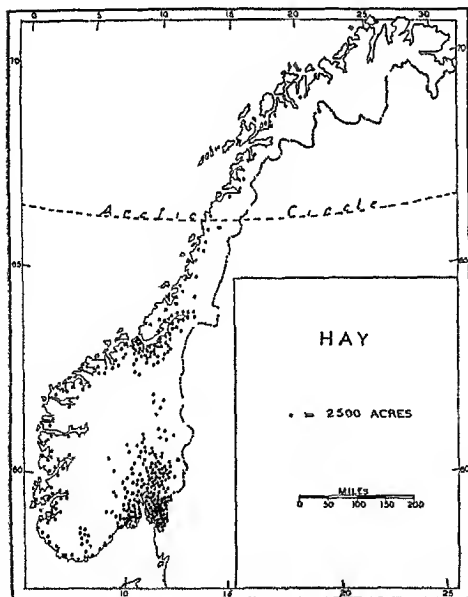
Political importance of the highland boundary. The highland which separates Norway and Sweden is one of the most effective boundaries in Europe. During winter the temperatures of the northern highland are exceedingly low, and, as a result this rugged land becomes practically impassable. Because of its barrier characteristics, this sparsely populated highland has greatly retarded communication and trade between Norway and Sweden. From the highland the land slopes westward and eastward. Thus Norway faces the open Atlantic and western Europe, while Sweden faces the Baltic and eastern Europe. Norway has emphasized the fisheries and the carrying trade, while Sweden has developed its inland resources to a much greater degree. The problems of the two nations have always been somewhat different, and it is not surprising that they found it difficult to remain together as one nation. But they were united for a long time—in fact, until 1905, when the union was peaceably dissolved.

The narrow seas which separate these countries from Denmark constitute a less effective barrier, and have always been easily

crossed. Thus Norway and Sweden have had close political relations with Denmark, and at one time Denmark held the two nations together by force.

The agricultural industry of the Peninsula The major resource of both Norway and Sweden is the soil, and in both countries agriculture is the chief occupation, but neither country is self-sufficient in foodstuffs. Norway imports approximately one-half of the grain consumed by her inhabitants. The agriculture of Sweden is better and more widely distributed than that of Norway, and Sweden is much more nearly self-sufficient in foodstuffs. Thus Sweden produces sufficient barley and oats to meet domestic requirements. But she imports two-fifths of the wheat and one-tenth of the rye that she consumes each year.

The use of crop land. From the agricultural viewpoint, nature was not kind to Norway. As already stated, the country is mountainous. Much of the land lies at high elevations, and is therefore cold. Glaciers and running water have scoured the soil off large areas. It is only by means of painstaking care and great labor that 3.5 per cent of the land has been brought under cultivation. (Illus., p. 439) This crop land is devoted chiefly to hay, oats, barley, and potatoes.



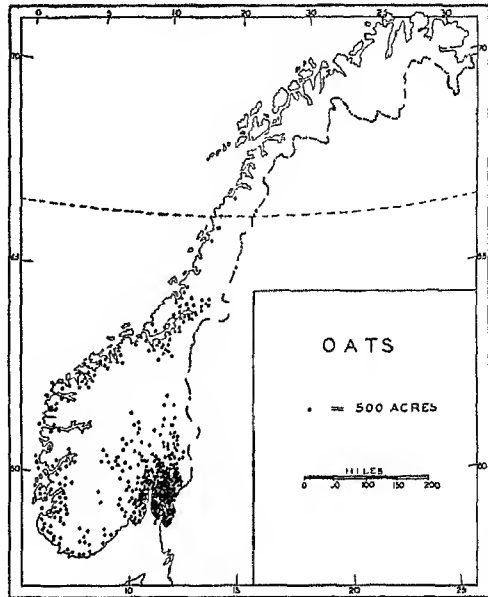
Map showing the distribution of hay in Norway.

Hay, oats, and potatoes are well adapted to the marine climate of Norway, since they thrive in regions that have cool, moist summers. These crops are grown in the valleys near Oslo and in the coastal districts of the country. Barley is also widely distributed in the coastal districts. This grain is surpassed only by hay and oats in acreage, and since it does not require as long a growing season as other grains, it replaces them in the northern part of the country. Study the distribution maps on this and the next page.

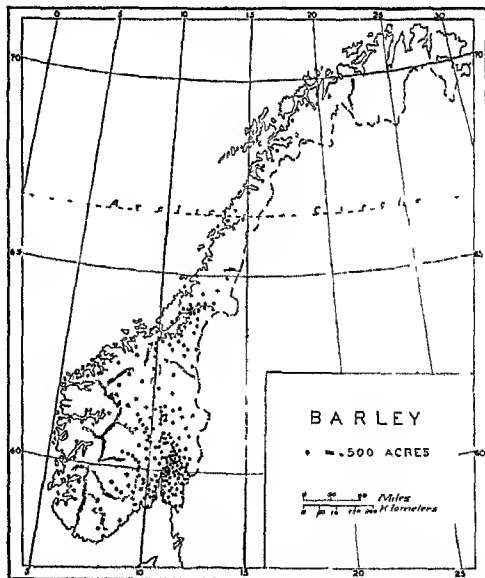
Since the winters are

long much hay is needed for cattle feed during that period. The making of hay in Norway presents difficult problems. Because of the great amount of rain and drizzle, the farmer cannot always wait to make hay when the sun shines. The moist air makes it difficult for him to cure or dry the hay. He therefore dries the crop by hanging it over racks that are made of poles.

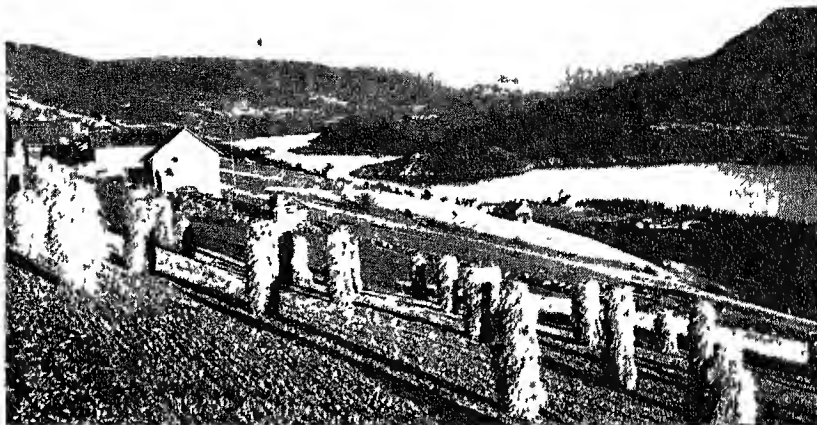
Sweden is more fortunate than Norway in having larger areas of land suitable for crops. Approximately 10 per cent of her total area is under cultivation. This cultivated land is given chiefly to hay, oats, wheat, potatoes, and rye. As in Norway, so in Sweden, crops adapted to cool, short summers are grown most widely. The wheat acreage of Sweden is comparatively larger than that of Norway, because of the more extensive areas of level land and the drier harvest season in the eastern part of the Scandinavian Peninsula. Yet Sweden is not self-sufficient. She must import from foreign countries approximately two-fifths of the wheat that she



Distribution of oats, the most extensively cultivated cereal crop of Norway.



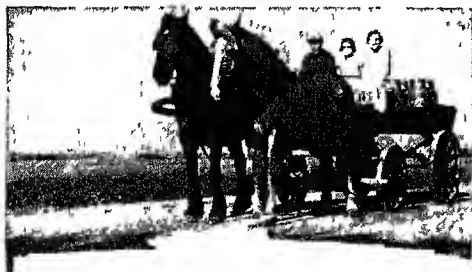
Distribution of barley. This crop may be grown farther to the north than any of the other major cereals.



One of the fertile valleys of southern Norway. Here dairying is important. Note the barley crop that is being harvested (Courtesy Natl. Travel Assn. of Norway.)

consumes each year. She has also developed an important sugar beet industry in the southern part of the country.

The livestock industry Most of the crops of Norway and Sweden are used as feed for livestock, the largest acreage being given to hay and forage crops. In addition, rugged highlands and many otherwise waste areas are used as pasture. Dairying is important in both countries (Pictures above and below). In Norway the products of that industry constitute her only agricultural exports.



Typical method in southern Sweden of hauling milk to the creamery. Note the levelness of the landscape—more common in Sweden than in Norway. (Photos by K. Kostich; courtesy Swedish Travel Information Bureau, Inc., N.Y.)

How the agricultural people live. Most of the farmers of Norway and Sweden live on their respective farms. Their holdings are generally small and are worked by the owners. Moreover, in most areas the broken character of the land surface, together with small size of farms, makes it difficult to use labor-saving machines.

ery Hand labor is the rule, especially in the highlands and in the smaller valleys The great urge is to get as much as possible from the small fields, and therefore intensive cultivation is practiced Yields are generally high per acre but low per man, and most of the farm people must eke out a meager livelihood from a harsh environment

Many of the agricultural people of Norway and Sweden are engaged in other activities during certain seasons of the year In both countries great numbers of farmers work in the lumber camps during the winter months, thus combining the agricultural and forest industries In Norway many of the farmers who live along the coasts are engaged in fishing from late winter through the spring of the year

Lumbering and pulpwood industries. Forests provide the raw materials for the most important manufactures of Norway and Sweden In both countries timber products make up the leading items of the export trade Sweden ranks first among the nations of the world in the export of wood pulp, and she rivals Finland and Russia in supplying Europe with lumber Norway is also outstanding as an exporter of timber products, chiefly wood pulp and paper She ranks among the five leading countries of the world in the export of wood pulp.

In Sweden forests cover approximately 59 per cent of the total area The most valuable of the forests are located in the central part of the country, since the south is used chiefly for agriculture and the north is too cold for the growth of commercial timber The commercial trees of central Sweden consist chiefly of pine, spruce, and fir The pine is used mainly for lumber, whereas spruce and fir are used in the making of wood pulp and paper. Sweden's 100 wood pulp factories turn out more wood pulp than does any other European nation More than two-thirds of this material is exported, although there is a tendency to retain an increasing proportion of the wood pulp and manufacture it into paper within the country. Most of Sweden's sawmills are located near the mouths of rivers and streams The timber is floated down these streams to the mills, where it is cut into lumber The streams also furnish the necessary water power—a factor of major importance to a nation that has practically no coal.

In Norway the chief stands of commercial timber are found in the valleys of the southeast, near Oslo. Here the streams and rivers

provide power and a means of floating the logs to the mills, which are located at the mouths of the rivers

The fishing industry. Of the fisheries of Norway and Sweden, those of Norway are the more important. Here the fishing industry is in large measure associated with coastal agriculture, since many of the farmers supplement their scanty agricultural income by catching fish. The industry is favored both by natural conditions, such as location with respect to excellent fishing grounds, numerous protected harbors, the presence of timber for the construction of boats and ships, and by the limited opportunities of the Norse people to make a living by other means.

The chief types of fish that are caught in the coastal waters of Norway are cod, herring, and mackerel. Approximately one-third of the total catch consists of cod. Most of these fish are caught along the western and northwestern coasts, chiefly near the Lofoten Islands, where the fish are dried and shipped to other parts of Norway and to foreign countries. Large quantities of dried cod are sent to Spain, Portugal, Italy, and other countries of southern Europe, from which Norway obtains in return citrus fruits, olive oil, and other products of semitropical lands.

The chief canning industry of Norway has developed in the west-coast cities of Bergen, Trondheim, and Stavanger. Commission houses and importing agencies in the United States generally deal with the fish-canning establishments located in these cities, when they make purchases of Norse fish products.

The mineral industries. Of the various mineral industries of Scandinavia, the Swedish iron and steel industry is the most important. Long before the discovery of the use of coke as a fuel in smelting iron ore, Sweden occupied a prominent place among the nations in the manufacture of iron, but this iron was smelted with the use of charcoal. Sweden is one of the few countries where charcoal iron is still manufactured in important quantities. Steel of unusually high quality is manufactured from this product. It is used in making some of the finest steel products in the world.

The chief basis for the Swedish iron and steel industry is the large reserve of ore—one of the most important in the world. This iron ore occurs chiefly in two areas—in central Sweden and in Lapland (northern Sweden). The ore deposits of central Sweden were the first ones to be used. Here the abundance of timber for the manufacture of charcoal, the proximity to important agricultural

and manufacturing centers that needed the iron and steel products, and the numerous lakes and rivers favoring ease of transportation all contributed to the early development of these ores. The setting of the Lapland ores is quite different. Almost every environmental factor of the area discouraged the early exploitation of these ores. This northern region is unforested, sparsely populated with backward people, the winter nights are long and cold, and transportation facilities had to be developed at considerable expense. As a result, mining operations did not begin until the present century and only after a railroad had been completed from the iron ore deposits to the Baltic Sea. Since the northern ports of the Baltic are closed by ice more than five months of the year, to offset this difficulty a railroad was constructed from the ore deposits to Narvik, an ice-free port on the west coast of Norway.

At the present time more than two-thirds of Sweden's iron ore is obtained from Lapland. This northern region contains large reserves of easily worked, high-grade ore. The metallic content of the iron ore exceeds 60 per cent, as contrasted with the 34 to 38 per cent ores of Lorraine, France.

There are some small deposits of copper, nickel, and zinc in Scandinavia, but the output is negligible. The great variety of minor metals needed for home consumption must be imported.

Water power. The abundance of water power in the Scandinavian Peninsula compensates in part for the lack of coal. The potential water power is estimated at 12,000,000 horsepower in Norway, and at 5,000,000 horsepower in Sweden. Less than one-fourth of this power has been utilized, and there are consequently great possibilities for further development. Yet both countries are making increasing use of hydroelectric power. The development has been most remarkable in Norway, a country which now ranks first in the world in the per capita use of electricity. (Illus, p 446.) Among the factors that have favored development are lack of coal, the steep highland slopes, heavy and uniform rainfall, numerous glacial lakes which serve as storage reservoirs, and large forests which prevent an excessively rapid run-off.

Electrochemical industries. The electrochemical industry of Norway and Sweden has developed with remarkable rapidity. Norway was the first nation to manufacture nitrate from the air (synthetic nitrate) on a commercial scale. Both Norway and Sweden today produce more synthetic nitrate than is required to meet

domestic demands This product is therefore exported to foreign countries In Norway the electrochemical industry takes approximately half of all the water power that is used within the country

Transportation and trade. The Scandinavian people have long been interested in maritime activities and have developed large merchant marines In fact, Norway's merchant marine ranks first in tonnage per capita among all of the nations of the world. This remarkable maritime development has been favored because of Norway's long and irregular coastline, the numerous protected harbors, experience in navigation gained in the off-shore fisheries, and the physical difficulties encountered in the development of land transportation The extremely rugged relief necessitates high construction and maintenance costs of roads and railroads The numerous steep-sided fiords which extend far inland constitute a marked barrier to the construction of north-south trending highways

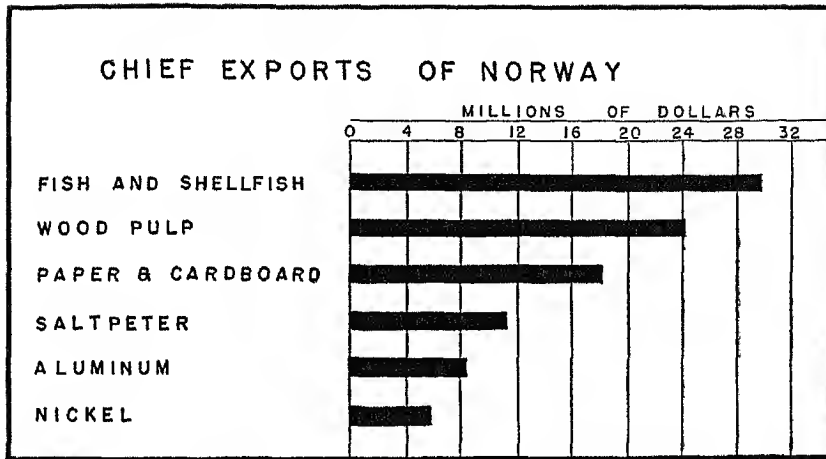
Most of the ships of Norway are engaged in carrying goods for other countries The earnings of these ships enable Norway to import more goods than she exports (in value). Sweden's maritime achievements are but little less notable than those of Norway. Her merchant fleet has a large tonnage, and most of her foreign trade must be carried by ocean-going vessels.

Merchandise exports and imports. The exports of Norway and Sweden consist principally of the products of forests, mines, and the sea. In both countries forest products are noteworthy. Sweden emphasizes the exploitation of her vast iron ore resources, while Norway ships great amounts of fish and electro-chemical products to foreign countries.

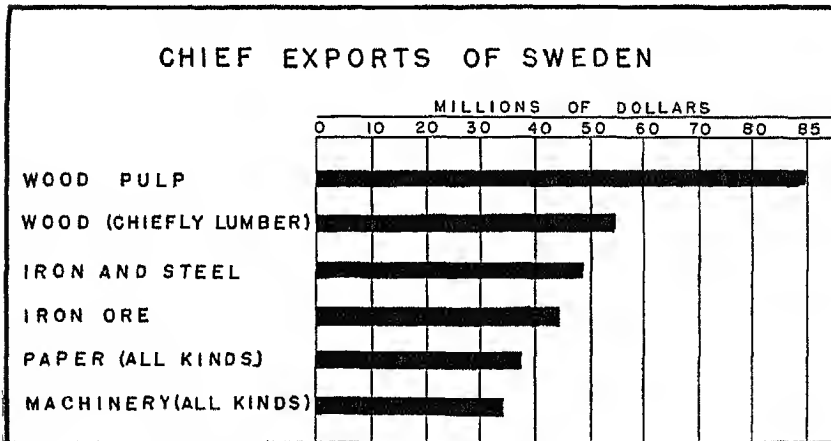
The imports of both countries consist mainly of foods, textiles, minerals (chiefly coal), and machinery.

Trade with the United States. Although Norway and Sweden trade chiefly with neighboring nations in Europe, especially the United Kingdom and Germany, their commerce with the United States is also important. Exports to the United States consist of wood pulp, newsprint, and fish. In return we send Scandinavian people cotton, machinery, fruits and nuts, mineral oils, automobiles, and grains

Scandinavian cities. The chief cities in the Scandinavian Peninsula are Stockholm, Goteborg, and Malmo, in Sweden; and Oslo, Bergen, and Trondheim, in Norway Stockholm, the capital of Sweden, is sometimes called the "Venice of Scandinavia." Like Venice, it is in large part located on islands. It possesses an excellent

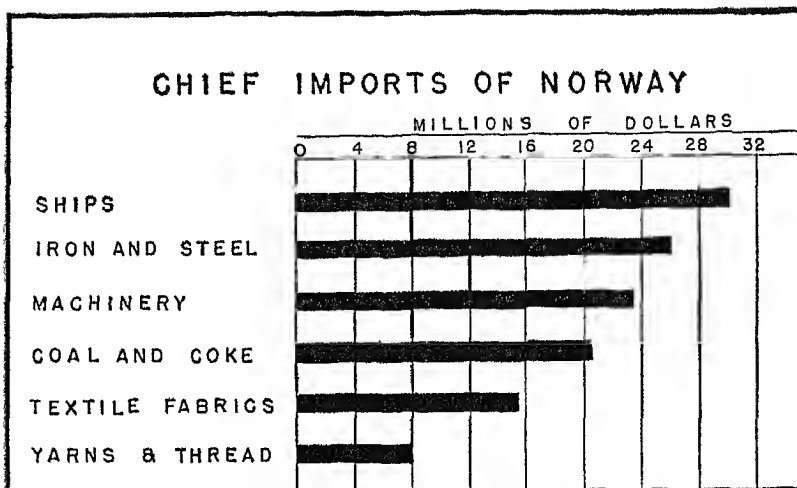


Leading exports of Norway during the period 1935-40.

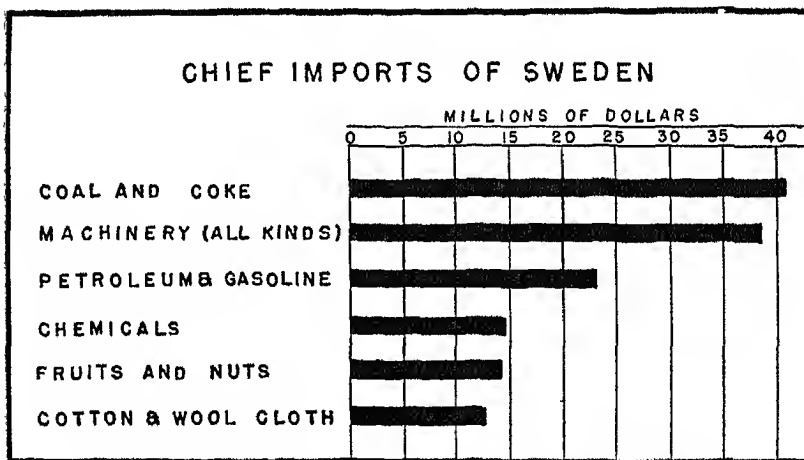


Leading imports of Sweden during the period 1935-40.

harbor and is favorably located with respect to a large consuming hinterland. The city serves as an important distributing center for Baltic and domestic trade. But the greatest port of Sweden is Goteborg, a city located on the western side of the lower peninsula. Malmö, the third city of Sweden, is located in the extreme southern part of the lower peninsula. Car ferries connect this city with Denmark and Germany. Oslo, the capital of Norway, is the leading importing city of that country. Bergen, the second largest city of



Leading imports of Norway during the period 1935-40



Leading exports of Sweden during the period 1935-40.

Norway, has an excellent harbor and an ideal industrial area which is making extensive use of water power.

FINLAND

A progressive people. The Finns have shown remarkable progress, in spite of an unfavorable environment and repeated invasions by their more powerful neighbors, Russia and Sweden. The country was conquered and controlled as early as the middle of the twelfth

century by the Swedes, and later by the Russians. Because of Finland's location between Sweden and Russia and the lack of any well-defined and easily protected natural boundaries, Finland has been a zone of conflict between these countries. Russian rule continued from 1809 to 1917, when Finland became an independent republic. Her difficulties are not, however, wholly political ones. In addition, she is forced to struggle continuously with an unfriendly environment. The country contains extensive areas of poor soil—large stretches of old hard rock that appear at and near the surface. Her people suffer from extremely cold winters and are further handicapped by a short growing season. Yet in spite of these difficulties, the Finns have developed a progressive nation and an advanced civilization. This republic, like other countries of northwestern Europe, possesses an invigorating climate, and the people are strong and energetic. They work with a determination to conquer their environment rather than to be conquered by it.

Characteristics and distribution of population. The Finns belong neither to the Nordic nor to the Slavic race groups of Europe. They are neither Swedish nor Russian in origin, although large numbers of Swedes and some Russians have settled in Finland. Nearly 90 per cent of the people may be traced back to Asiatic nomads who settled in Finland as farmers, hunters, woodsmen, and traders. They adopted the more advanced European civilization, which was brought to them chiefly by way of Sweden. These descendants of the Asiatic nomads, who now constitute the masses of Finland's population, are a hardy, industrious, faithful, and hospitable people. Because of their ability to cope with hard frontier conditions, they have made splendid progress at home and abroad. Their dependability and thrift are shown by the fact that, while other European countries have defaulted in the payment of their debts to the United States, Finland has met her financial obligations.

With 3,700,000 people, Finland has a lower population density (27 per square mile) than any other European nation except Norway. The greatest numbers of these people are concentrated in the southern and southwestern parts of the country. These areas are the more accessible to foreign countries, and contain better soils as well as a more moderate climate than are possessed by the eastern and northern regions of Finland.

Agriculture the chief occupation. The economic life of Finland centers mainly about agriculture and forestry. These occupations engage more than two-thirds of the workers. As compared with



Harrowing a field in southern Finland. The landscape here looks much like that of many of the glaciated districts of Minnesota, Wisconsin, Michigan, and New England. (Courtesy Consulate General of Finland, New York)

Norway and Sweden, Finland has a much larger proportion of people who depend upon agriculture. In this respect Finland is more like Russia than Scandinavia.

Agriculture as related to climate and land surface. The rapid development of agriculture in Finland is remarkable in view of the far northern location of that country. Study a map and note the latitude of Finland. Compare it with Alaska and Iceland. The climate is most favorable for agriculture in the southwest, where the rainfall is approximately 25 inches a year. (Map, p 438.) But most of the country has short summers and long, cold winters, a climate that favors the growth of coniferous (cone-tree) forests rather than crops.

The land surface also is unfavorable for widespread crop culture. The underlying rocks are extremely hard and weather slowly. Ice from glaciers further modified the land surface by removing much of the original soil. Large glacial lakes, swamps, bogs, and marshes together cover nearly one-third of the area of Finland. The lakes are numbered by the tens of thousands.

This combination of poor land surface and unfavorable climate accounts in large measure for the small percentage of cultivated land. The land now under cultivation covers only 6.8 per cent of Finland; whereas forests occupy 60 per cent of the total area. Although additional land can be cleared for crops, such work requires con-

siderable capital. More crop land is generally added at the expense of the forests. But it is costly in human effort to clear the forest land of trees, brush, and stumps. Moreover, the better land has already been brought under cultivation.

Trends in crop production. The crop land of the country is devoted mainly to hay, oats, rye, barley, and potatoes, in the order named. Rye and potatoes constitute the chief food crops, and are being grown to an ever increasing extent. Barley is produced for food as well as for feed and gives satisfactory returns farther to the north than do the other cereals. The increasing use of land for hay and oats suggests the growth of the dairying industry, which today occupies an important place in Finnish agriculture.

Trends in the dairying industry. The dairy industry shows a rapid development, especially since the World War. This industry is well adapted to the natural environment of Finland. Many areas, such as glacial bogs, marshes, and stony lands, though unprofitable for crops, may be used in part at least for pasture. Climate and soil favor the production of hay, forage crops, and hardy cereals, such as oats and barley. All of these feeds are consumed by dairy cattle. In addition, the industry has been stimulated by means of the development of co-operative societies, which aid the farmers in finding the best world markets. These sellers' and buyers' co-operative societies are comparable to those of Denmark and Sweden.

Forest industries. With more than 60 per cent of its total area in forests Finland has developed important industries that are based on the use of this natural resource. She rivals Sweden in supplying Europe with lumber and has become an important producer of wood pulp, newsprint and veneers. More than two-fifths of all industrial workers are engaged in the industries that use wood as the basic raw material and more than four-fifths of all exports (in value) consist of the products of such industries.

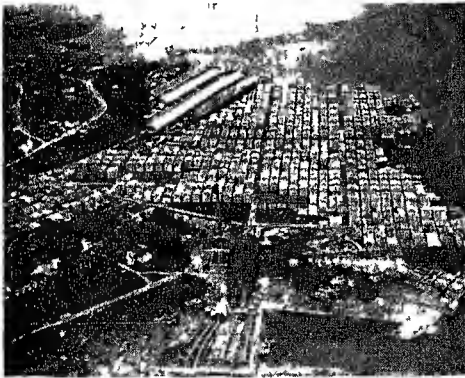
Use of water power. The natural environment of Finland favors the use of water power. As part of an ancient hard-rock highland known as Fenno-Scandia, Finland is lacking in coal, petroleum, and natural gas. On the other hand she is well equipped with an abundance of water power estimated at approximately 1,800,000 horsepower. As in our New England states, the glacier created many falls and rapids by forcing streams to take roundabout courses, often over rock ledges and glacial deposits. The glacier also formed numerous lakes and swamps. These retard the run-off, and therefore make

possible a steady flow of water, which is of great value in the development of water power. But much power remains to be developed, as indicated by the fact that only 380,000 horsepower are used at the present time.

The future of Finland's manufacturing industry will depend in large measure upon the further development of the water power and the more complete use of the extensive forests of the country.

Transportation. The development of road and railway transportation in Finland suffers from certain handicaps, such as the sparse and scattered population and the broken land surface with its numerous lakes, swamps, and marshes. The great extent of inland waterways, estimated at nearly 50,000 miles, offers only a partial solution to the transportation problems, since nine-tenths of the waterways are unsuitable for navigation, although they are used for the floating of timber. Moreover, recent trends in Finland's transportation show a declining use of the waterways and an ever increasing use of railways and highways. In view of the physical difficulties and sparse population, Finland is making remarkably rapid progress in the development of her transportation system.

Foreign trade. As a source of forest products Finland occupies an important place in the commercial world. Within recent years, timber and the products of the woodworking industries have made up more than four-fifths of the total value of her exports. Many foreign countries obtain wood pulp, lumber, veneers, and newsprint



Air view of the lumber-exporting port of Kotka, on the southern coast of Finland. The numerous piles of lumber are awaiting shipment to foreign countries. (Courtesy Consulate General of Finland, New York.)

from this northern country (illus at left). The sale of these products makes it possible for Finland to import many different kinds of manufactures, foodstuffs, and raw materials. The lack of local coal and iron deposits is suggested by the import list, the major items of which include metals, machinery, chemicals, coal, and coke.

Directions or channels of trade. Two nations—

the United Kingdom and Germany—play leading parts with respect to Finland's foreign trade. She exports more products (in value) to the United Kingdom than to any other country; whereas Germany constitutes the major source of imports. Her trade with Sweden, the United States, and France is also important. Finland sells large quantities of pulpwood and paper to the United States, and receives many items in return, the most important being raw cotton.

THE BALTIC STATES

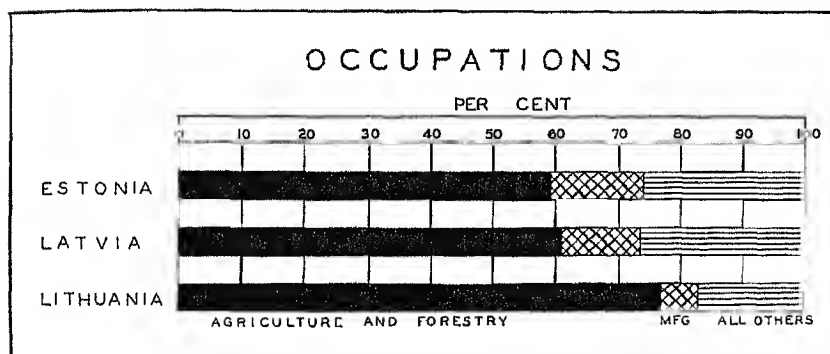
Differences in population. The three Baltic States—Estonia, Latvia, and Lithuania—were formed after the World War from the western part of European Russia. Today these countries cut Russia off from the sea and separate Poland from Finland. (Illus., p. 454.) They also constitute a transition zone between Finland and Poland. The people of Estonia resemble their neighbors, the Finns, in culture, religion, and language. Like the Finns, they are descendants of Asiatic nomads, speak an Asiatic tongue, and have been influenced by Swedish culture. On the other hand, the Lithuanians, the inhabitants of the southernmost of the Baltic States, resemble the people of Poland in culture, race, and religion, and many of them are Poles. Latvia occupies an intermediate position, geographically as well as socially. Her people show a considerable intermixture of the Finnish type in the north and the Polish and Lithuanian elements in the south.

Lack of natural boundaries and its political importance. Since the Baltic States occupy a part of the Great European Plain, they lack natural barriers and have always been easily invaded. With small populations and meager resources, they have been unable to withstand invasions by more powerful neighboring peoples, such as the Germans, the Poles, the Swedes, and the Russians. Of these invaders the Germans have exerted the most dominant economic influence over the Baltic States. They controlled most of the industry and trade, and owned the greater part of the agricultural land. Before the World War, German and Russian landowners made up only one and one-half per cent of the total population, yet they owned approximately 60 per cent of the farm land. After the Baltic States became independent, their governments acquired many of the large holdings from the wealthy German and Russian landowners. The estates were then divided and sold to the peasants.

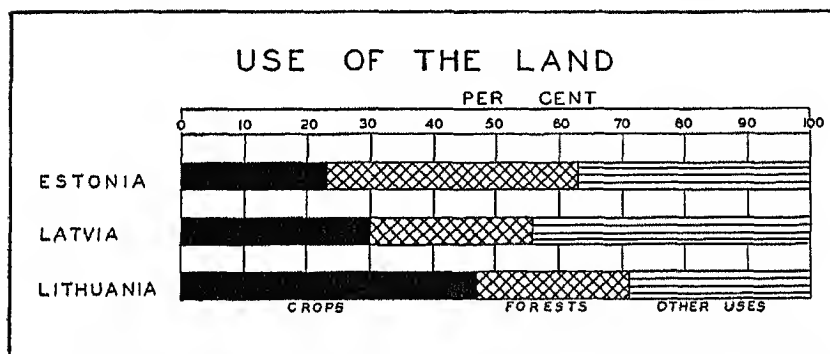


Outline map showing the position of the Baltic States with respect to neighboring countries. Note the chief ports and the railway lines that connect these states with Russia, Finland, Poland, and East Prussia

Agriculture, the leading occupation. Most of the people of the Baltic States are engaged in agriculture, with forestry as a secondary occupation (Chart, p 455.) Many of the farmers work on the land during the summer months and in the forests in winter. The agricultural industry is relatively more important in the southern part of these states than in the north, as indicated by the decreasing percentage of crop land from south to north (Chart, p 455) In addition, the percentage of total working population engaged in



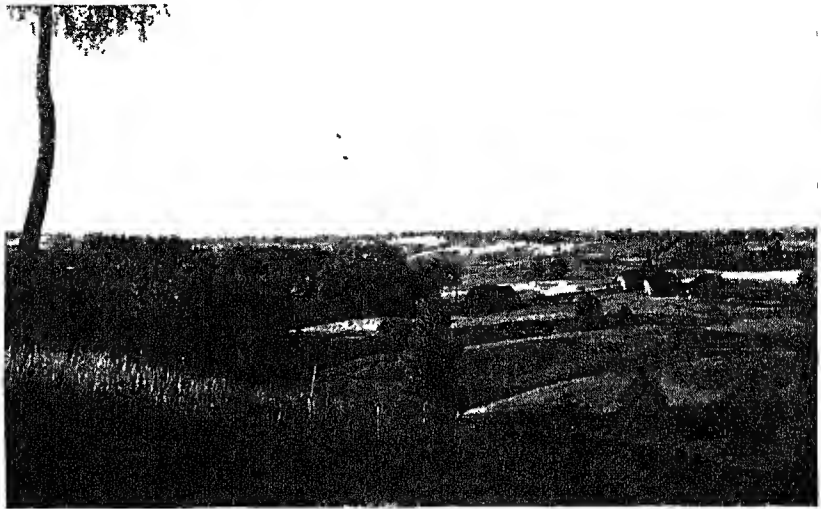
Major occupations in Estonia, Latvia, and Lithuania



The use of the land in Estonia, Latvia, and Lithuania. Note the decrease in the percentage of crop land from Lithuania, in the south, to Estonia, in the north.

agriculture decreases from south to north, as indicated by the top chart on this page. The crops raised in Estonia are much like those grown in the neighboring country of Finland; whereas the crops grown in Lithuania are similar to those of northern Poland and East Prussia.

Recent trends in agriculture When the Baltic States were a part of Russia, major emphasis was placed on the raising of grains. This practice was further stimulated by the wealthy estate owners who controlled most of the land. Grains are still produced, yet more attention is being given to the development of the livestock industry, especially dairying. This development has been associated with the



Agricultural landscape in Lithuania. There is a higher percentage of crop land in Lithuania than in Latvia and Estonia. (Courtesy Consulate General of Lithuania.)

subdivision of the large estates. Better cows are being selected and more land given to hay, root crops, and pasture. In short, more milk-producing feeds are being raised. As in Scandinavia and Finland, co-operative dairies as well as co-operative buying and selling organizations have been developed.

The crops. The short summers and severe winters tend to limit the variety of crops that can be grown. Wheat is of little importance, except in the south (Lithuania). But even in Lithuania more than two and one-half times as much land is given to rye, a quick-maturing crop, than to wheat, which matures more slowly. In fact, rye constitutes the chief bread grain produced in these northern countries, and the crop carries over into the neighboring areas, East Prussia and Poland. Barley and oats are also important. As hardy cereals, they give good yields in regions that have short, cool summers. Flax and potatoes are also well suited to such climatic conditions. As in Germany and Poland, the potatoes are used for industrial purposes (alcohol and starch) as well as for direct human and animal consumption. Flax is grown for its fiber, which is used in the manufacture of linen, and for its seed, from which linseed oil is made. Since flax fiber and linseed oil have a world-wide market, flax has become the chief *cash crop* of these countries.

Manufacturing. Manufacturing in the Baltic States is as yet in its infancy, as evidenced by the fact that Lithuania has only 6 per cent of its working population engaged in industry, while Latvia has 12 per cent and Estonia 15 per cent. As in Sweden and Finland, many workers are employed in the wood pulp, lumber, and match industries; while others prepare butter, cheese, meat, flax fiber, and linseed. The most important meat-packing industries are in the south, while the making of forest products occupies a relatively more important place in the north.

With the exception of soil and forests, these countries are poorly equipped with natural resources. The minerals consist chiefly of sand, clay, peat, and oil shale. The oil shale occurs in Estonia, where it is mined at the rate of approximately 500,000 tons a year.

Prewar industries related partly to trade. Before the World War these small countries were a part of a large consuming market area of Russia. A large part of Russia's surplus grain, fiber flax, and timber was exported by way of Baltic ports. But the imports were normally much smaller in quantity than the exports. Instead of entering the Baltic ports with only a small cargo, ships carried bulky raw materials, such as coal, iron ore, and cotton, at low rates and thereby made use of the cargo space. Such raw materials laid down at Baltic ports stimulated the development of various industries, and the products were shipped to the interior of Russia. But the World War and the loss of the large Russian market brought destruction to some of these industries.

Foreign trade. Most of the foreign trade of the Baltic States passes through three seaports—Tallinn, Riga, and Klaipeda. In the north, Tallinn handles approximately three-fourths of the foreign commerce of Estonia. Riga, the largest city in Latvia, handles three-fifths of the trade of that country; whereas most of Lithuania's trade passes through Klaipeda. These cities export chiefly agricultural and timber products, while most of the imports consist of manufactured goods.

AN OVERVIEW OF NORTHERN EUROPE

Northwest Europe is inhabited by hardy, capable, energetic peoples whose activities are stimulated by an invigorating climate. These peoples have made great progress in spite of their relative poverty of resources. However, because of the lack of opportunity at home,

an almost constant stream of emigrants has moved out of this area to many parts of the world. Their explorations, conquests, and settlements in distant lands make up some of the most interesting chapters of the history of civilization. It has been stated that man is the greatest export of the region. With the emigrants have gone human energy and ability.

While many of these peoples have been seeking opportunity in distant parts of the world, others have sought to develop the home resources. For centuries they have found the greatest economic opportunity in the development of agriculture, fishing, and forest resources. During the last few decades they have turned attention to the development of iron ore resources and the harnessing of water power.

As in the past, so in the future, the economic life of northern Europe will continue to center about the use of the soil, forests, products of the sea, minerals, and water power. To an ever increasing extent the soil is being used for hay, grain, and the dairying industry. The timber resources in all probability will long serve as the raw materials for the leading manufactures and the major items of export. The permanency of these industries will depend largely upon the extent to which the forests are protected from overcutting. In order that forestry may become a permanent occupation, the yearly cut of timber should not exceed the yearly growth. This policy has already been adopted. Unlike the widely distributed forest industries, large-scale commercial fishing and mineral industries show a more marked concentration. For example, of these northern countries, Norway, because of her excellent location, fine sheltered harbors, and poverty of resources, has turned to the sea for a living, and ranks well ahead of the rest in the commercial fishing industry. Sweden ranks first in the mineral industries, chiefly because of her abundance of high-grade iron ore. But otherwise northern Europe as a whole is poorly equipped with essential minerals. The lack of coal is partly offset by the tremendous water-power resources, which are being used to an ever increasing extent. One of these countries (Norway) now ranks first among the nations of the world in the per capita use of electricity developed from water power. The future increase in the manufacturing industries of northern Europe will be closely associated with the more complete use of hydroelectric power.

QUESTIONS AND EXERCISES

- 1 Why is the population sparse in the Scandinavian Peninsula? In what parts of the Peninsula is the population density greatest? Why?
- 2 In what ways does Norway differ from Sweden in climate and in land surface?
- 3 Compare and contrast the crops grown in Norway with those produced in Sweden
- 4 Explain the importance of the timber-product industries of Norway and Sweden
- 5 How have natural environmental conditions favored the development of fisheries in Norway?
- 6 Explain the development and present importance of the iron and steel industry of Sweden
- 7 Make lists of the exports of Norway and Sweden Norway generally imports much more (in value) than she exports How is that possible without her becoming greatly indebted to foreign countries?
- 8 The Finns have made remarkable progress in spite of an unfavorable natural environment Explain
- 9 If you were to visit Finland what economic activities would you want to see? Why?
- 10 How does the agriculture of Estonia differ from that of Lithuania?

FURTHER READINGS

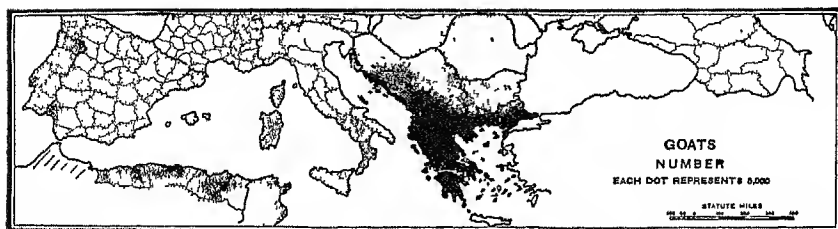
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A region of outstanding contributions to world agriculture. Southern Europe consists of three peninsulas—the Iberian, the Italian, and the Balkan. These three peninsulas are part of the Mediterranean Region, which has contributed more to world agriculture than has any other region.

Contribution of domesticated plants. It is believed that wheat, the chief grain of occidental peoples, had its origin in the eastern basin of the Mediterranean and became a domesticated plant in this region. Even today wheat is the most important cereal in several of the lands that border the Mediterranean Sea. From this region wheat culture has spread to other parts of the world. Barley, alfalfa, various kinds of beans, high-grade wine grapes, almonds, and many other crops either originated or were first domesticated in this region. Thus the Mediterranean peninsulas of southern Europe received the benefit of early development and use of many of the most valuable domesticated plants of the temperate zone.

Contribution of farm animals. Sheep and goats have long been important animals in the three peninsulas of southern Europe. These animals are native to rugged mountains and dry plateaus. Their wild relatives are still found in inaccessible highlands, such as the arid and semiarid highlands of central Asia. Sheep and goats are therefore able to survive in relatively poor pastures, whereas cattle, horses, and hogs require much better feed. The Iberian, Italian, and Balkan peninsulas of Europe contain large stretches of highland. Moreover, during a part of the year the extremely dry climatic conditions of these areas produce poor pastures.

The merino, one of the best types of fine-wool sheep, originated in the interior highlands of the Iberian Peninsula. These sheep have developed rather thin, wiry bodies, since they have been forced to migrate long distances in search of food. They are, therefore, not good meat or mutton producers, but they are well known for their wool. From Spain merino sheep have been sent to many other parts of the world. Since they are sensitive to excesses of moisture, the merinos have proven to be most successful in the



Distribution of goats in southern Europe. In the Mediterranean Peninsula, where the dry summers cause sparse and poor forage for livestock, the goat is of great importance. Note the great concentration of goats in the Balkan Peninsula. (Adapted from U. S. Dept. of Agriculture map.)

arid and semiarid parts of the New World, South Africa, and Australia.

The goat is even hardier than sheep. This animal is able to pick a living on scant pastures in regions of very rugged relief. It is not surprising, therefore, that goats should occupy an important place in the farm life of southern Europe, especially in the Balkan Peninsula. With its extremely rough land surface this region stands out as the foremost in the world in respect to numbers of goats per square mile of land. The small country of Greece has nearly 5,000,000 of these animals. Look at the map at the top of the page and notice the distribution of goats.

The goat is a good milk producer and in both Greece and Turkey it is by far the most important dairy animal. Goat milk is a wholesome food and is used in making butter and cheese. In many districts of Spain, goats are taken from place to place and milked before the door of the consumers. Goats are also raised for their skins and hair. Unlike sheep, which are raised largely for their wool, most goats have a valueless coat. In this respect, the Angora goat is the outstanding exception, since its hair constitutes the mohair of commerce. But Angora goats are raised chiefly in Asia Minor and in southern Africa rather than in the peninsulas of southern Europe.

Cattle and donkeys have also been raised for a long period of time in southern Europe. The Spaniards took these animals with them to the New World. The well-known Texas longhorns, which at one time were the chief cattle of our Great Plains, may be traced back in origin to the Iberian Peninsula.

Thus southern Europe has contributed to world agriculture by the development of domesticated animals as well as by the culture of domesticated plants.

Agriculture the major occupation. As a major occupation, farming is relatively more important in the economic life of the people of southern Europe than it is in western Europe. In the three Mediterranean peninsulas, from 50 to 60 per cent of those engaged in all occupations are agricultural workers. By way of contrast, it was pointed out in Chapter 20 that the agricultural population of western Europe is surpassed by industrial workers.

Why has there been such marked emphasis on agriculture as compared with manufacturing in south-European countries? At one time this part of Europe occupied the leading position in industry and commerce. But with the coming of the Industrial Revolution the countries of western Europe were better able to develop large-scale industries, since they were much better supplied with important mineral and timber resources. Among the Mediterranean peninsulas of southern Europe, only Italy has achieved any notable success in the development of modern manufacturing industries, and this has been accomplished in the face of adverse environmental conditions.

Handicap because of backward methods. Agriculture, as well as other occupations, is handicapped because of the prevalence of backward methods. Although southern Europe was at one time the leader in agriculture, industry, and commerce, other regions have greatly surpassed this area in all of these activities. Southern Europe as a whole has remained a region of backward peasants, who till their tiny fields with great care. Their methods of agriculture are intensive rather than scientific in character. Unlike the Netherlands, Belgium, Germany, and other countries of western Europe, south European countries have done comparatively little by way of scientific experiments in agriculture. One of the chief reasons for this backward condition is the high percentage of illiteracy to be found in many of the nations of southern Europe.

MAJOR FACTORS AFFECTING THE AGRICULTURE OF SOUTHERN EUROPE

Four major factors. Why has southern Europe made important contributions to the agriculture of the world? Why is a large proportion of the population engaged in agriculture? Why do the people suffer because of backward methods? These and many other questions can be understood much better if we will briefly examine

four major factors. These are. (1) location, (2) the characteristics of Mediterranean climate, (3) the characteristics of relief, and (4) the long and important history of the region.

The location. By reason of its location, southern Europe has long been in touch with Asia and northern Africa. To the south the Egyptian civilization reached a high point of development and to the east lay the Asiatic lands of Palestine, Syria, and Mesopotamia. Just across the Mediterranean in northwest Africa was the land of the Moors. It is not surprising, therefore, that the centers of earliest European civilization should develop in southern Europe. From this region civilization spread to western and northern Europe and to the New World.

Various methods of irrigation agriculture spread into southern Europe from the adjacent regions of northern Africa and southwestern Asia. The Moors of northern Africa brought an advanced type of irrigation agriculture into many districts of the Iberian Peninsula.

Moreover, Mediterranean lands have long been favored because of early contacts with the Orient. Oriental plants were introduced. Of these, citrus fruits are noteworthy. It is believed that citrus fruits originated somewhere in southeastern Asia. From that part of the Orient, citrus fruits were taken to southern Europe where they now occupy a very important place in the economic life. In fact, southern Europe is one of the three most important regions of the world in the production of oranges and lemons, the other regions being within the United States.

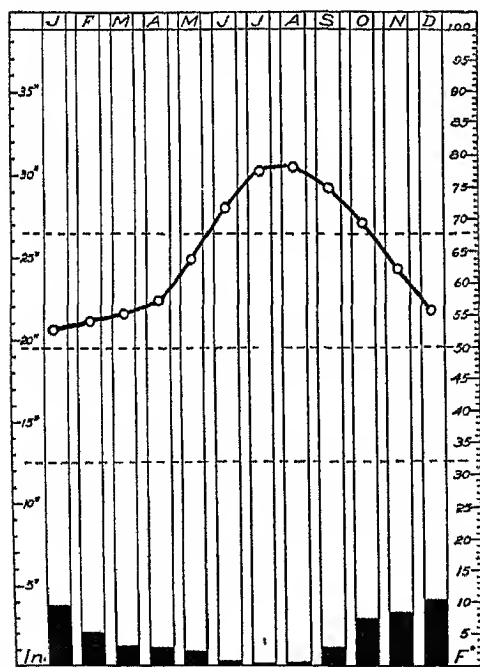
But the Orient and Africa have not kept pace with the advancement in civilization that has characterized western Europe and the United States. Africa is, in fact, called the "Dark Continent." Thus during the last 100 years, location of southern Europe with respect to these regions has been a handicap in several respects, especially in regard to economic and social development. This fact is nicely illustrated by the Iberian Peninsula, which opens its arms to Africa. It is separated from Africa only by the narrow Straits of Gibraltar; whereas it is cut off from western Europe by the great mountain barrier, the Pyrenees. There is considerable meaning associated with the saying "Africa begins at the Pyrenees." It is interesting to note that a very high percentage of illiteracy is found among the inhabitants of southern Spain and Portugal; that is, in that part of the Iberian Peninsula that is located near Africa. On

the other hand, the most advanced people of the Iberian Peninsula are found in the north, where they have established close contacts with the peoples of western Europe, especially with the French

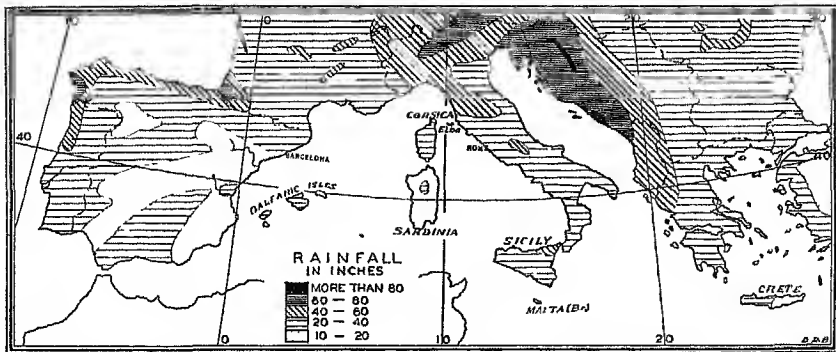
The climatic factor. The climate of southern Europe also reflects the importance of the location factor. Because of an intermediate situation between the westerly wind belt and the northeast trades, southern Europe is located first in one of these wind belts, then in the other. During our summers the wind belts of the world shift northward and accordingly the drying trade winds of the Sahara are brought northward over this region. Thus the Mediterranean summers are characterized by clear blue skies and extremes of drought. In southern Europe the time of greatest heat is therefore not associated with the time of most abundant rainfall. The drying winds during the hot Mediterranean summers make it necessary for the inhabitants to irrigate the crops that require much moisture during this period of the year. For example, oranges and lemons

are always grown with the aid of irrigation.

On the other hand, winters are moist, since the southward shifting of the wind belts places the Mediterranean Basin under the influence of the westerlies. Hence the Mediterranean climate has winter rain and summer drought. (Graph at left.) Look at the rainfall map on page 465 and notice the distribution of rainfall. Fortunately Mediterranean winters are mild as well as moist. The mild winters are due to (1) semitropical location, (2) the protecting highlands to the north, and (3) the moderating influence of the Mediterranean Sea.



Average monthly rainfall and temperature conditions at Malta, a British island located just south of Sicily. Note the winter rain and summer drought.



Average annual rainfall in various parts of the Mediterranean peninsulas of Europe. Most of the land on these peninsulas gets only from 20 to 40 inches of rain a year, and large areas receive only 10 to 20 inches. Here the rainfall is greatest towards the north, on western exposures, and in the highlands.

The mild winters and dry summers have favored the production of winter wheat in Mediterranean lands. This crop is planted with the coming of rains during the fall of the year, grows during the mild, moist winters, and is harvested during the dry period of late spring and early summer. A dry harvest is always desired where wheat is grown.

The relief factor. The three Mediterranean peninsulas of southern Europe consist largely of rugged land. (Map below.) Mountains and plateaus cover the greater part of Spain, Portugal, Italy, and the Balkan countries. Lowlands are narrowly limited in extent. They consist mainly of narrow coastal plains and river valleys.

The lowlands are extremely dry and hot during summer, while



Physical structure of the Mediterranean peninsulas. Note the large areas of rugged land.

the higher mountain slopes are cool. Winds rise in crossing the highlands; they are therefore cooled and lose some of their moisture. Thus many of the Mediterranean highlands contain good pastures while the adjacent lowlands suffer from drought, except where irrigation is practiced. Since the Mediterranean peninsulas contain many mountains as well as lowlands, livestock are driven up into the cool mountains during the summers and down to the lowlands in winter. This seasonal migration of whole families with their livestock has been called transhumance.

The historic factor. All three peninsulas have experienced a glorious past, and all three have failed to regain their former standing. The past importance of these areas is indicated by such statements as "Spain, once mistress of half the world," "the grandeur that was Rome," and "Greece, the country in which European civilization was born."

Rise and decline of Spain and Portugal. Through exploration and conquest, the people of Spain and Portugal developed mighty empires. Into the home ports, large ships, known as galleons, brought precious metals from the New World and spices from the Orient. The home lands grew wealthy. But the glory faded all too soon. Spain and Portugal lost most of their possessions, as one colony after another gained its independence. With the loss of colonies, the sources of former wealth disappeared and the fight to retain the colonies sapped the mother countries of wealth and man power. They also failed to develop domestic sources of wealth to take the place of that lost in foreign lands. Only the wealthy, the nobility, and the leaders were given the advantages of an education. It is, therefore, not surprising that two-fifths of Spain's people above the age of 10 can neither read nor write, and that more than three-fifths of Portugal's people above the age of 10 can neither read nor write; and that more than three-fifths of the inhabitants of Portugal are illiterate. Internal strife has further retarded progress. In the years 1936 and 1937 Spain was experiencing one of the most violent revolutions in its history.

Italy's glorious past. Like Spain and Portugal, Italy has also had a glorious past. Here was the center of the great Roman Empire. This vast empire extended from Egypt to Germany and from the Persian Gulf to Spain. During this period of Roman power, Italy made noteworthy contributions in the fields of science, literature, arts, and government. Many excellent roads were built. One may

still see remains of these old, well-built Roman roads in Italy, France, Spain, and other parts of the former Roman Empire. In Italy a number of the larger highways center on Rome. You have probably heard the saying, "All roads lead to Rome."

But the Roman Empire weakened, and barbarian warriors swept down upon Rome. The Roman Empire crumbled and Rome fell in A.D. 476. With the decline of central power and authority, the Italian Peninsula was divided into a number of city-states. Cities such as Venice and Genoa developed great commercial importance during the Middle Ages (500-1500). These cities and the city-states regulated trade to their own advantage and were quite independent of one another.

Not until 1870 did Italy emerge as a unified nation, as the various city-states were united. Hence modern or present-day Italy is quite young. It is, in fact, an old nation that has been reborn. It was organized into one united nation after Great Britain and France had already obtained large colonies. Within recent years, especially since the World War, Italy has made strenuous efforts to recover something of the power and "grandeur that was Rome." Efforts have been made to establish an important colonial empire. With a great population density and a large increase in population each year, Italy is reaching out for additional sources of food and raw materials. These were some of the objectives that finally led to the conquest of Ethiopia in 1936. But such military campaigns call for great expenditures of capital and human energy.

Although Italy has not reached its former heights of power relative to the rest of the world, she has made marked progress in industry and commerce, especially since 1900. At the present time Italy surpasses the countries of the Iberian and Balkan peninsulas in regard to modern manufacturing and foreign trade.

The Balkan Peninsula and its past. The Balkan Peninsula has also had a glorious past. Greece, the southernmost country of the peninsula, is considered the cradle of European civilization. This peninsula is located near the junction point of three continents—Europe, Asia, and Africa. There are a number of islands located between Greece and Asia Minor. These islands acted as stepping-stones at an early time, when navigation by sea was yet in its infancy. The inhabitants of Greece were therefore the first of all European peoples to establish contact with the civilizations of Asia. The sea opened its beckoning arms to the Greeks. It invited them

to the adventurous life of the trader and navigator. Through trade they established contact with Asiatic and Egyptian civilizations and obtained new ideas. A new and better culture was developed as the better ideas obtained from other civilizations were added to and mixed with their own

Since the Balkan Peninsula consists largely of a complex system of mountain ranges, level land is scarce. Nearly all the cultivated land is located in small isolated river valleys. Thus trade supplemented their limited agriculture as a means of making a living. Their constant struggle with a relatively harsh environment—a mountainous country with almost rainless summers—made the Greeks energetic and vigorous.

The great number of mountain ranges not only made a harsh environment for crop production, but it also caused internal disunity. Many little city-states grew up in the area which is now Greece. The numerous little plains hemmed in by mountains became the sites of these small political divisions. Although the city-states were independent political areas, they would unite when attacked by some powerful foreign country, as they did at one time against Persia.

The best-known of the city-states were Athens, Sparta, Argos, and Thebes. Athens was long the most powerful, but jealousy of Sparta and other independent Greek states finally flamed up into long periods of warfare that often ended without any gain to either side. Such periods of warfare wasted money and energy. Finally, the age of the powerful city-states came to an end. The prostrated little areas fell an easy prey to more powerful neighboring countries.

Greece then passed from one ruler to another, the last being Turkey. Turkey acquired not only Greece but also other countries of the Balkan Peninsula. Under Turkish rule, internal strife broke out among the various nations of this area. At times this internal friction was fostered by the Turks so that the various nations of the peninsula would not unite in a movement for independence, but a number of them finally did unite, and in the Balkan War of 1912-1913 the allied Balkan states gained a decisive victory over Turkey.

Long periods of warfare against one another as well as outside nations have sapped their energies and wasted their resources. Progress has been greatly retarded. The Balkan Peninsula of today, unlike that of old, contains some of the most backward people in Europe. Even Greece, the cradle of European civilization, today

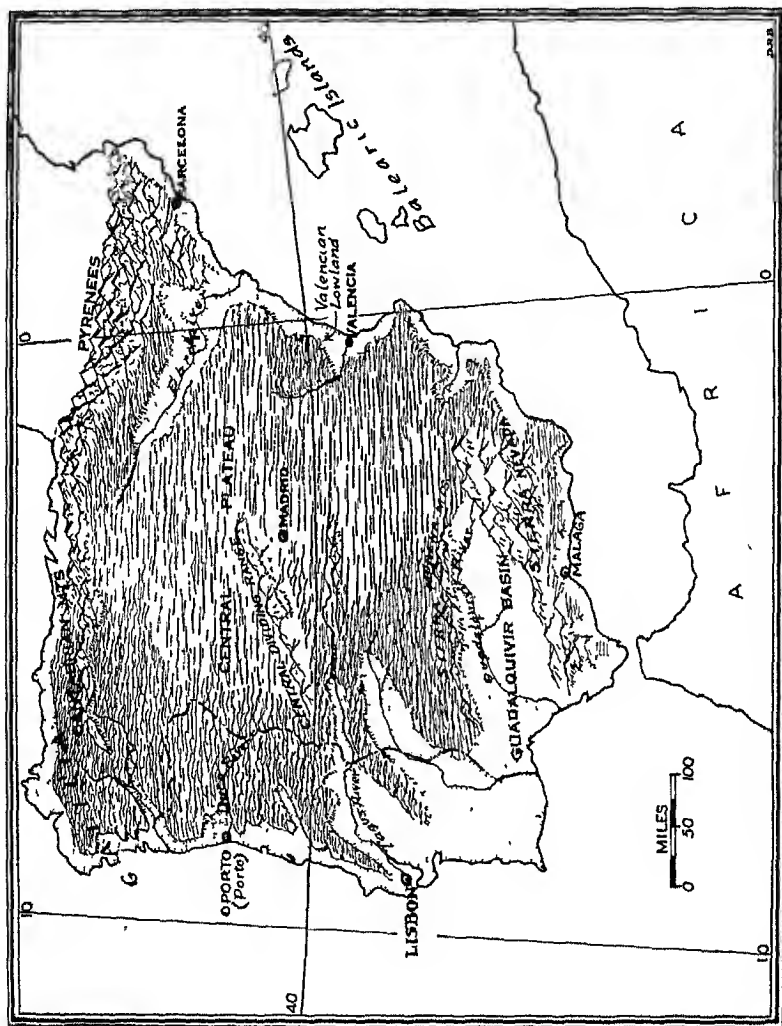
suffers from widespread illiteracy Agriculture has advanced but little Wooden plows, similar in construction to those used 2,000 years ago, are still used in some parts of Greece.

QUESTIONS AND EXERCISES

- 1 How has southern Europe contributed to the agriculture of the world?
- 2 Why are sheep and goats more numerous than cattle in the Mediterranean peninsulas of Europe?
- 3 Why has there been such marked emphasis on agriculture, as compared with manufacturing, in south-European countries?
- 4 In many parts of southern Europe the agriculture is intensive Why are yields generally low in spite of intensive agriculture?
- 5 In what ways did location aid the early development of centers of civilization in southern Europe?
- 6 Explain the winter rain and summer drought of the Mediterranean peninsulas
7. What are the advantages and disadvantages of the Mediterranean climate for the production of crops?
8. How has land surface of southern Europe affected major human activities in that region?
9. Explain the rise and decline of Spain and Portugal
- 10 How did the relief and location of Greece affect its past history?
- 11 Explain the retarded economic progress of the Balkan Peninsula.

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Major relief features and natural regions of Iberia.

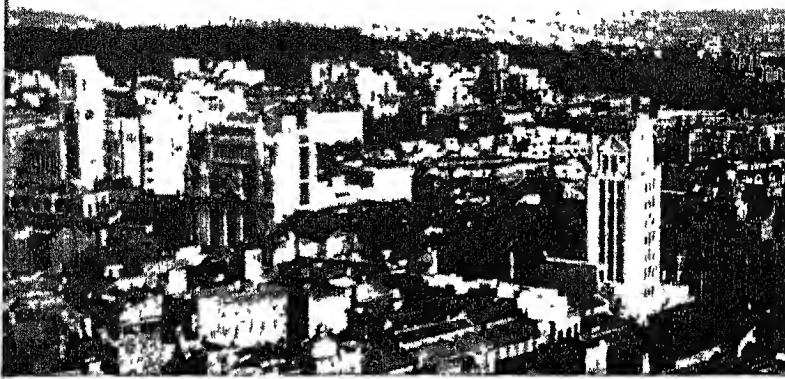
SOUTHERN EUROPE—AGRICULTURE (Continued)

AGRICULTURE IN THE IBERIAN PENINSULA

Major disadvantages in Spain. Of European countries only Russia and France surpass Spain in size. Yet Spain shows no economic development comparable to that of other large European countries. Spain's industries are, in fact, matched even by those of relatively small nations. Its people make a living mainly by means of agriculture. Yet the country does not produce sufficient food to meet domestic needs. There is much waste land. Only one-fifth of Spain is under cultivation, although much more land is considered suitable for the growth of crops. Moreover, the yields of most crops are conspicuously low.

There are many reasons for this low degree of development in Spain. Look at the map on the opposite page and notice the large amount of land that is mountainous and dry. Only the northwestern part of Spain is humid, the rest of the country being arid and semiarid. Fertile, level land is practically confined to the river valleys and narrow coastal plains. Large stretches of rugged highlands not only constitute a disadvantage with regard to farming, but also retard the development of modern means of transportation.

Spain, a land of diverse regions and peoples. Poor methods of transportation and communication have made it difficult for people in one part of the country to mingle with those of some other part. The development has been different in the various regions of the country. This isolation of various areas has resulted in regional differences in custom, language, dialect, and in the way people make a living. The Central Plateau, known also as the Meseta, is inhabited by the proud Castilians. The western Pyrenees of northern Spain is the land of the active and capable Basques. The northwestern corner of Spain is inhabited by the Galicians, who are much like the neighboring Portuguese. The eastern lowlands contain a still different group of people, known as Catalans. They are the best educated and most advanced of all the Spaniards. The southern provinces of Spain constitute Andalusia, inhabited by the gay, quick-witted



Air view of Madrid (1936), the great plateau center and capital city of Spain (Courtesy Spanish American Society)

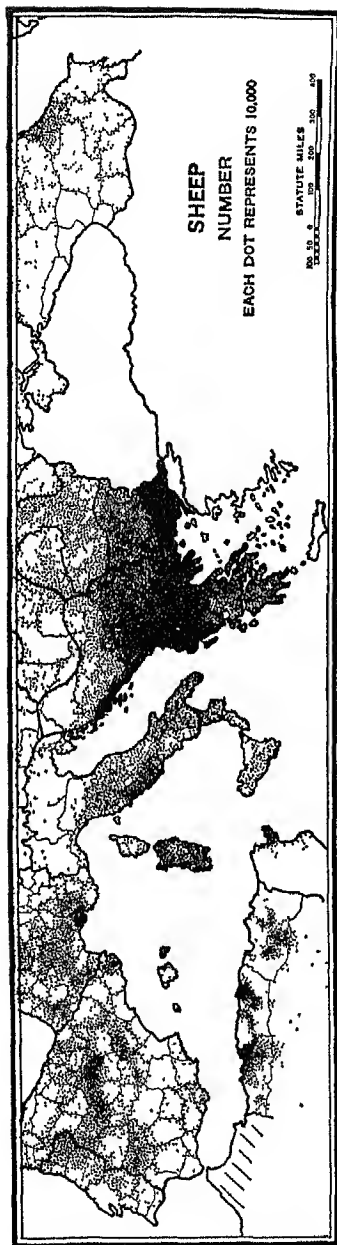
Andalusians. The following pages will be devoted to a study of the major regions of Spain, the inhabitants, and their agricultural life.

The Central Plateau or Meseta. The great Central Plateau is Spain's largest region. It is a treeless, windswept, dusty tableland which is occupied by the proud Castilians. On this high, dry, and mountain-studded region long mule trains may be seen plodding across the extensive barrens, reminding one of the Sahara and its camel caravans. Although a number of railway lines have been built on this plateau, many districts lack both road and rail contacts with other parts of Spain.

Madrid is the only really large city of this sparsely populated plateau. (Picture above) It is the capital of Spain and the center of the poorly developed transportation system. Other plateau cities, such as Toledo and Saragossa, contain many interesting medieval fortifications and castles that were erected by the Moors.

The environment favors the grazing industry. The most widespread activity of the plateau is grazing. In many places one may see large flocks of sheep tended by shepherds clad in sheepskin jackets and leather breeches.

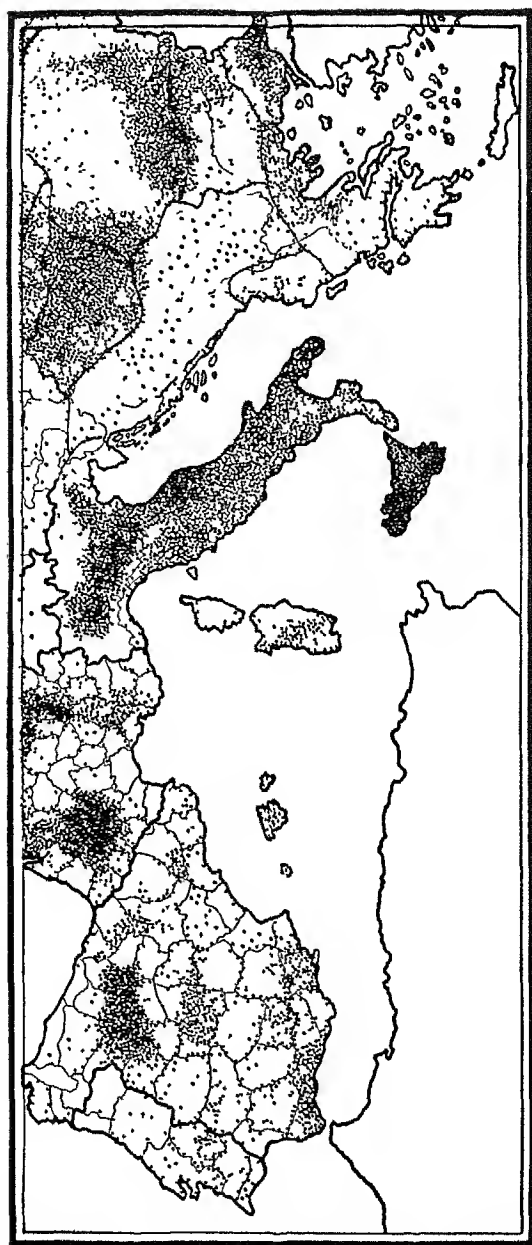
Unlike the Mediterranean coastal regions of Spain, the high, dry interior plateau has extremely cold weather during winter. In fact, there is sufficient ice formed on the inland waters to make skating possible. On the other hand, the summer heat and light rainfall render the land arid and semiarid. Spain has an abundant rainfall



Distribution of sheep in southern Europe (Adapted from U S Dept of Agriculture map)



Citrus fruit production in southern Europe Note the importance of the Valencian Region of eastern Spain (Adapted from U. S Dept of Agriculture map)



Winter wheat acreage of southern Europe Each dot represents 5,000 acres (Adapted from U S D A map)

only in the northwest, a region that is under the influence of the westerly winds. However, the high altitude causes cool conditions on mountain slopes and often more rainfall than in the lowlands, since the winds, in rising over the highlands, give up some of their moisture.

The environment of the Central Plateau, therefore, favors the grazing industry in the interior of Spain. Here is the native home of the fine-wool merino sheep. Large numbers, sometimes as many as 10,000 to a single flock, may be seen grazing on the dry vegetation of the Central Plateau. During summer the cooler mountain slopes are the chief grazing grounds. Thus many of the flocks of Spanish sheep are migratory, summering in the mountains and wintering on the plains. Forced to migrate great distances, merino sheep have developed thin, sturdy bodies. These animals are used for their fine wool rather than for mutton.

Sheep-raising—an extensive type of agriculture. Sheep-raising appears to be most profitable on the sparsely populated grasslands of the world. As population increases, crop production becomes more important and land prices go up. The better watered grazing areas become crop lands, and sheep decline in numbers.

Cattle and hogs are much less numerous than sheep in the interior highlands of Spain. Cattle are found in some of the fertile areas, in valleys, and at the base of mountains, where water is more abundant or where irrigation is practiced. Hogs are raised chiefly in the corn-producing areas of northwestern Spain.

Crops on the Central Plateau. Look at the map on the opposite page and notice the distribution of wheat in Southern Europe. In Spain a larger acreage of land is devoted to wheat than to any other crop. On the Central Plateau wheat is by far the most important cereal, both in acreage and in total yield. The best wheat lands of the plateau are in the more humid northern and northwestern parts, especially in Old Castile. Here flour milling has become important in some of the cities, such as Valladolid and Zamara.

Galicia, the humid northwest corner of Spain. Find the northwest corner of Spain on the map. You will see that this area is located just to the north of Portugal and is called Galicia. Because of its nearness to Portugal, Galicia contains many people who are much like the Portuguese in language and culture. Here the population density is much higher than that of the plateau.

Unlike the dry Central Plateau, Galicia has a humid climate. The westerly winds blow over this region the year round and cause a heavy, well-distributed rainfall. In fact, the rainfall reminds one of western Europe. But the temperatures of Galicia are higher. On the whole, the climate is invigorating for human development, yet other factors have caused backward conditions. The scarcity of level land has seriously handicapped agriculture, which is, nevertheless, the most important occupation. Poor transportation constitutes another disadvantage. Although Galicia has a long, broken coastline and many harbors, the rugged relief back of the harbors causes poor contacts with the interior. Under such conditions, many small ports have sprung up, yet not one of them has become very important commercially. Fishing in the offshore waters has become an important occupation, and is surpassed only by agriculture. Here sardines and tunny fish are caught. This is one means whereby the people who live on farms in the small coastal valleys can supplement their meager agricultural income.

By reason of contacts with other people, especially through trade and the fisheries, the coastal population is further advanced economically and socially than the people who live farther inland.

Farming in Galicia The agricultural life of Galicia is varied in character. Many different crops are grown in this region. In the little valleys one will find fields of corn, wheat, rye, and on the sheltered valley slopes the grape vines are cultivated. Most of the higher slopes are covered with forests of oak, chestnut, and beech. Yet large sheep- and cattle-grazing areas also are found in the highlands.

Unlike the dry Central Plateau, Galicia produces but little wheat—less than 3 per cent of Spain's total wheat output. On the other hand, it is the leading region of Spain in the production of corn and rye. It also produces corn-fed hogs as well as hogs that pick a living on the roots, nuts, and shrubs of the woodland areas.

As in most parts of Spain and Portugal, Galicia suffers from a poor system of education. The greater number of the inhabitants are illiterate. Such people do not make the best use of their land and resources. They lack the knowledge of modern, efficient methods of agriculture, instead, their methods of cultivation are wasteful. They could increase crop yields by following more modern methods of agriculture. They could expand the grazing industry by utilizing many of the highland areas which now constitute waste land and by

improving the breeds of their livestock. Yet many people leave this region each year. Most of them emigrate to Argentina.

The Cantabrian Region. On the east, Galicia gives way to the Cantabrian Mountain Region. Here agriculture is relatively less important than it is in Galicia, since level land is even less plentiful. Like Galicia, the Cantabrian Region is sufficiently moist for the production of corn and rye, and the slope lands are devoted to forests and pastures. Cattle and sheep graze on the native pastures of the highland slopes. Here, also, the peasants employ backward methods of farming. But fortunately the Cantabrian Region is famous for its minerals. It produces about two-thirds of the coal and half of the iron ore mined in all of Spain.

The Pyrenees Region. The Pyrenees Mountains constitute one of the most important highland barriers in all of Europe. They cut off the Iberian Peninsula from the rest of Europe. This peninsula is separated from Morocco, Africa, only by the narrow Straits of Gibraltar. Spain and Portugal have therefore been under the influence of African culture and at one time were actually controlled by the Moors of northern Africa.

The Pyrenees Mountains contain only a few low passes and they are crossed by only one railway which, unfortunately, is expensive to operate. The great altitude and rugged relief of these mountains cause extreme difficulties in regard to transportation. But fortunately there are narrow lowlands at both ends of the Pyrenees. Here railway lines provide contacts between France and Spain. These lowlands are better developed economically than the Pyrenees.

Ancient customs and practices are well preserved within the Pyrenees Mountains. Here live more than 500,000 Basques, who have preserved their customs and language through many centuries. Here also the little state of Andorra has preserved its independence within the highland fastnesses of the Pyrenees.

The region as a whole is poorly developed economically. Most of the inhabitants are engaged in agriculture. Little agricultural villages nestle in the valleys. Near the villages may be seen small patches of hardy cereals, such as oats, rye, and barley. Apple orchards are also found in nearly all the valley districts. But stock-raising is the most widely distributed of all the economic activities of the region. Sheep and cattle are the chief types of livestock. Large flocks of sheep are driven up into the highlands during summer and down into the valleys in winter. Cattle are raised for their milk

and meat. Many of them are also used to pull wagons, plows, and other agricultural implements.

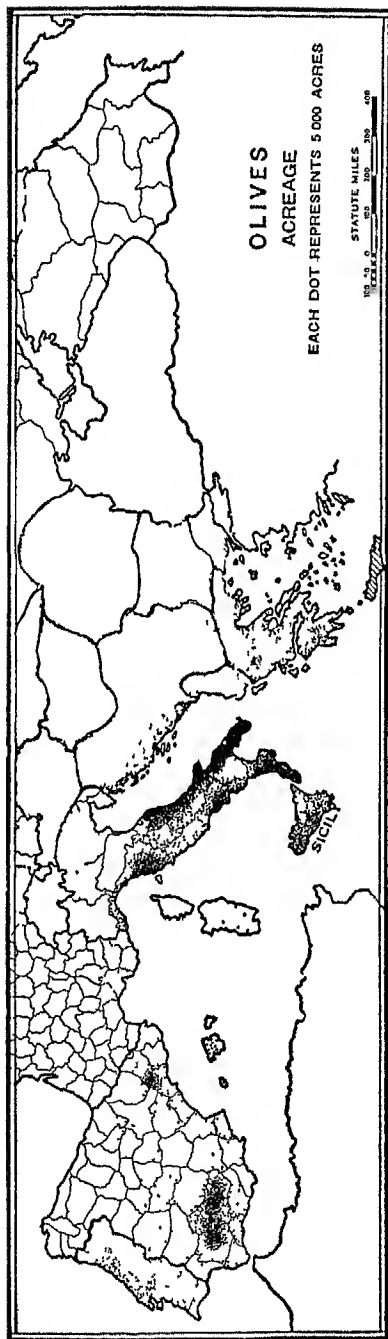
The eastern lowlands. Unlike the moist northwest, the eastern lowlands of Spain have a hot, dry climate. Dryness is due to the location of this region on the leeward side of the Iberian Peninsula. The westerly winds bring an abundant rainfall to the western part of the peninsula—that is, to Portugal and northwest Spain, but these winds lose most of their moisture before they reach eastern Spain.

Although the climate is dry, the region is nevertheless very productive. It is, indeed, one of the most productive areas in the entire Mediterranean Basin. It contains a narrow coastal plain. The most important division of this plain is in the area of Valencia. Here it is called the Valencian Plain. To the north the narrow coastal lowlands extend beyond Barcelona, the leading industrial center of Spain.

The wealth of the eastern lowlands lies in their agriculture. By means of irrigation practices introduced centuries ago by the Moors, the fertile soils of the lowlands are made to yield abundantly different kinds of crops. Here one will find the center of the great fruit-producing region of Spain. Much land is devoted to orange, lemon, fig, date, and olive orchards. There are also fields of grapes and mulberries. Valencia is the seat of Spanish silk culture and orange production. Many districts produce grapes, the eastern lowlands being the chief region of wine production in all of Spain. Grains are grown chiefly during winter. For example, wheat is sown at the time of autumn rains, grows during winter, and is harvested during the dry period of late spring or early summer. The swampy parts of these coastal lowlands produce some sugar cane and rice.

Advancement in agriculture has been realized chiefly because of a progressive population. Eastern Spain is the home of the Catalans, whose language resembles that of the people of Provence, southern France. They think of themselves as distinct from the Spaniards, and they have also sought to become a separate country, known as Catalonia. Their ability is shown not only in agriculture but also in manufacturing. They have made Barcelona the foremost industrial center of Spain.

The Guadalquivir Valley. The valley of the Guadalquivir River is the largest lowland in southern Spain. Find this valley in the



Olive acreage of southern Europe. (Adapted from U S Dept of Agriculture map)



Acreage of grape vines in southern Europe (Adapted from U S Dept of Agriculture map)

illustration on page 470 It is a warm, sheltered valley that contains picturesque Moorish cities As part of Andalusia (southern Spain), it is one of the regions of which the poets sing Since southern Spain opens its arms to Africa, this region has long felt the influence of Northern Africa The inhabitants are gay and good tempered, but they are neither as energetic nor as industrious as the people of the eastern lowlands

The people of the Guadalquivir Valley make a living mainly by means of agriculture Most of the land of the valley is devoted to wheat fields, olive orchards, orange groves, and vineyards It is the foremost area for the production of olives in all of Spain. (Illus , p 479) This fact is important commercially, since Spain surpasses all other countries in olive oil production and export

Agriculture in Portugal. Since Portugal is located in the western part of the Iberian Peninsula, it is directly in the path of the westerly winds Rainfall is therefore more plentiful in Portugal than it is in Spain Portugal is also favored with large stretches of lowland, especially in the south Northern Portugal, however, is the western part of the Central Plateau of Iberia.

Although climate and relief favor agriculture, the nation suffers from backward methods At the present time it is unable to produce enough food for its own people. Primitive methods of agriculture cause low returns per acre. The most primitive methods and backward conditions are found in the southern provinces, which have witnessed a considerable influx of people from northern Africa. On the other hand, the most capable and energetic people are found in the north

Agriculture is the major occupation of the Portuguese Wheat, corn, and rye are the major crops Yet olives, wine, and cork are products for which Portugal is best known in foreign countries.

Find the valley of the Duro in the illustration on page 470 This river valley is one of the richest wine-producing areas of all Europe Grapevines grow by the wayside; and they cling to cottage roofs, crags, and trees For a distance of more than thirty miles along the Duro River may be seen great terraces of grapevines. The market for this grape area is Oporto, which is situated near the mouth of the Duro. It is the exporting center of the well-known port wine of commerce.

The cork oak is found in nearly all parts of Portugal It is also grown in southwestern and northeastern Spain. Portugal, however,

is the foremost producer of cork. Nearly one-half of all the world's cork is produced in Portugal, and about one-fourth is supplied by Spain.

Thousands of people are engaged in stripping cork and in preparing the product for market. Stripping the bark from the cork oak tree takes place every nine or ten years, but not until the trees are 20 years old. The best harvests of cork are not realized until the trees are about 40 years old. The bark is removed in large slabs. With a knife or a hatchet a cut is made all the way around the tree near its base and another just below the branches, care being taken not to cut beyond the bark into the inner layer. Then lengthwise cuts connect these round incisions, and the bark is pried off. Cork bark is also removed from the larger branches. Stripping is usually done in July and August.

The cork oak forests also provide food for livestock. Large numbers of hogs feed on the acorns found in the oak forests. Sheep graze on the higher forested slopes, especially in central and northern Portugal.

Many of the farmers who live near the coast of Portugal are engaged in fishing as well as in agriculture. For the country as a whole, fishing ranks second only to agriculture in importance.

AGRICULTURE IN ITALY

Population largely dependent upon agriculture. With an area of 119,760 square miles and a population of 42,438,000, Italy is a densely populated country. For the country as a whole, there are about 354 people to the square mile as compared with 42 per square mile in the United States. The most important occupation of these people is agriculture. Yet only about half of Italy is suitable for farming. Nearly all of the better land has already been planted to crops. Even many of the lower slopes of the Apennine Mountains are devoted to farming. The Italians have also tried desperately to increase the crop land by means of drainage of coastal swamps and by irrigation of the dry lands. But in spite of their efforts, they cannot grow enough food for home use. Although the major portion is produced at home, some food must be imported from foreign countries.

A country of diverse regions. The agricultural conditions in Italy differ from place to place because of differences in natural environ-

ment Climate varies from the cool, humid Alps in the north to the dry, hot, and sunny regions of the south Relief also varies from place to place The leg of the "boot of Italy" consists of a mountainous backbone known as the Apennines Mountains also ridge the upper part of the boot in the extreme north Lowlands are found chiefly in the coastal regions and in the valley of the Po River

The Po Basin. The Po Basin consists of the plain of the Po River and the adjacent highland slopes This region is the most important agricultural and industrial area of Italy Although it contains less than one-seventh of Italy's total land area, it is the home of nearly two-fifths of the country's people It contains large cities, such as Milan, Turin, and Venice This region also possesses fertile agricultural lands and a large rural population

The area which is now the Po Plain was at one time an extension of the Adriatic Sea Later the shallow waters of that area were filled with large quantities of silt brought down by the Alpine rivers and streams Thus the plain of the Po has been built up It has become a fertile and well-watered region—watered by the numerous rivers and streams which empty into the Po At the present time, the upper or western part of the Po Plain has a rapid drainage, and irrigation is widely practiced On the other hand, the lower or eastern part of the plain is poorly drained Here hundreds of miles of dikes prevent the river from flooding vast stretches of land

Many crops are grown in the valley of the Po. The most important cereals are wheat, corn, and rice Wheat covers the greater acreage. It is sown in the fall of the year and grows during winter It is generally grown on the higher, better-drained lands of the valley. Corn ranks next in acreage, and the Po Valley is the only important corn-producing region in Italy In other parts of the country the summers are too dry for the growth of this cereal The Po Valley receives rainfall during summer as well as winter Rice of excellent quality is grown in the irrigated upper part of the valley as well as in the delta region of the Po Look at the map and you will notice that this valley is located about 45° north of the Equator In the United States, the 45th parallel extends through states such as Maine, Michigan, and Wisconsin What, then, makes rice culture possible so far to the north in Italy? The reason is chiefly that the Po Valley is protected from the cold winds of west-central Europe by the great highland barrier, the Alps.

The Po Valley also produces silk, fruit, and livestock products. Many districts of this region produce mulberry, the leaves of which are consumed by silkworms. Italy is the leading country in Europe in the production of raw silk, most of which is produced in the Po Valley. Olives and grapes are also grown in this region. In many places grapevines are trained around the mulberry trees. In this northern valley olives are grown during summer; but olive production is relatively more important on the dry, sunny slopes of central and southern Italy.

The Apennines. The Apennine Mountains constitute the backbone of Italy. They extend in the form of a huge arc, with the ends of the arc nearly touching the west coast and the center nearly touching the east coast. These highlands cover a large part of Italy and limit the amount of land that can be profitably cultivated. Considering the vast stretches of rugged highland, it is surprising that Italy has brought more than 40 per cent of her total land area under cultivation.

The Apennines provide excellent pasturage in their upper part, whereas the south-facing slopes are devoted to vineyards and olive groves. In the warm foothill districts citrus fruits are grown. The valleys and gentle slope lands also produce wheat. During normal years Italy produces more than 200,000,000 bushels of that cereal. Although much of the country's wheat is grown in the plains, such as the Po Valley, there is also a considerable amount produced in the highlands. In the highlands, extensive rather than intensive methods prevail. Highland wheat culture, therefore, contrasts with the intensive methods employed in the Po Valley and the plains near Naples.

The western plains of Italy. Of the various regions of Italy, only the Po Valley surpasses the western plains in importance. In contrast to the eastern plains of the peninsula, the western plains are more extensive. Here are located the plains of the Arno Valley, the plains near Rome, called the Roman Campagnà, and farther south, the plains in and about Naples.

The northernmost of these plains constitute the valley of the Arno River, known as Tuscany. On their small, fertile farms the Tuscan peasants produce olives, grapes, grains, and vegetables. In many districts all of these crops are grown on the same land. Large amounts of wheat and barley are produced during winter. The

wheat is of the hard variety used in the making of macaroni and spaghetti, which are important foods in Italy. The Arno Valley produces excellent olive oil, used largely in the place of butter. The Arno Valley is therefore very productive, and the standards of life are quite high as compared with most other parts of the country. Yet the dense population has caused considerable emigration to foreign lands, especially to Argentina, where these people are welcome because of their high standards.

Farther to the south one finds the lowland region in which Rome is located. Here Rome is situated on its seven hills, but surrounding the hills of the region are swampy lowlands, which until recent times were unhealthful because of the widespread occurrence of malaria. During Roman times the waters of the coastal lowlands were diverted into ditches and used to irrigate crops. At that time these lands were well suited to agriculture. But the removal of forests in the adjacent slope lands has caused ruinous erosion and destructive floods over large areas. Much of the lowland, therefore, became swampy in character. Farmers abandoned their grain fields. Some of them used the wet lowland for pasture and therefore became herdsmen, while others moved into the hilly parts of the region. The hills and near-by volcanic slopes have long supported groves of olives, figs, and oranges, as well as luxuriant vineyards. In recent years, especially since the World War, large lowland areas have been drained, thereby making the land suitable once more for agriculture, and at the same time improving the health conditions of the region.

Still farther to the south in west-coast Italy lie the plains of Naples, known also as the Neapolitan Plains. They constitute a highly productive area and support very many people on each square mile of land. The mild, sunny climate and the fertile, volcanic soils favor the production of olives, grapes, figs, vegetables, and grains. Here is a veritable garden area of Italy, since the farming is intensive—that is, much energy is used in farming each acre of land. Backward farming methods, however, have unfortunately caused lower yields than could be obtained with modern farming in this fertile region.

The eastern plains. The eastern plains are located on the leeward side of the peninsula and are therefore drier than the windward western plains. In these eastern lowlands, especially in the “heel” of the “Italian Boot,” backward methods and extreme dryness cause

low yields per acre. The chief crops of the region are those best adapted to dry conditions. Of these the olive is noteworthy. Nowhere in Italy has olive production attained a more prominent place in the agricultural system. Nearly two-fifths of all productive land in the "Heel" is devoted to olive trees. Italy is surpassed only by Spain in the total production of olive oil, although the Italian product is considered somewhat higher in quality. In Italy olive oil is used as a substitute for animal fats.

Wheat and grapes are other important crops in the eastern plains. An excellent type of wheat, high in gluten content, is of special value in the manufacture of macaroni. Grapes do well in the area because of the long roots of the grapevine. They reach far downward in search for water. The long roots make it possible for the plant to withstand periods of drought which occur during the desert-like summers of this region.

Agriculture on the islands of Italy. Of Italy's islands, Sicily and Sardinia are most important. Sicily is one of the most densely populated agricultural areas in all of Europe. Here live more than 4,000,000 people, most of whom make a living by means of agriculture. They produce wheat, barley, vegetables, grapes, oranges, lemons, and nut crops. Sicily is one of the leading lemon- and almond-producing areas of the entire Mediterranean Basin. But there are also numerous disadvantages, such as destructive earthquakes, droughts, malaria in the swampy coastal districts, widespread poverty, and illiteracy. These unfavorable conditions have forced many to emigrate each year from this densely populated island. Living conditions in Sardinia are even more backward than in Sicily. More than nine-tenths of Sardinia's land surface is mountainous. Thus relatively little land is devoted to crops. Moreover, agriculture suffers because of primitive methods, and the production per acre is generally low. Unlike Sicily, most parts of Sardinia are sparsely populated. Sicily contains five times as many people as Sardinia.

AGRICULTURE IN THE BALKAN PENINSULA

Great differences in relief and climate. The countries of the Balkan Peninsula are Yugoslavia, Albania, Bulgaria, Greece, and European Turkey. These nations show striking irregularity of land surface and a marked difference of climate from place to place. The



View of Mt Etna on the island of Sicily. In the foreground, sheep graze on the highland pastures (Courtesy Italian Tourist Information office)

larger part of the peninsula consists of rugged highlands. In the western area the Dinaric Alps of Yugoslavia descend steeply to the Adriatic Sea. Farther to the east the Balkan Mountains stretch eastward through Bulgaria almost to the Black Sea. The highland regions are broken up by river valleys which open southward into the Adriatic and Aegean seas and northward into the valley of the Danube. The northern and northeastern parts of the peninsula are exposed to the cold northeast winds of winter and the moist, water-bearing winds that blow from the Black Sea during summer. The northern and northeastern areas, therefore, have summer rainfall, which is much needed for the successful production of corn or maize. On the other hand, the southern and southwestern coastal areas have winter rain and summer drought, since they enjoy the sunny Mediterranean type of climate. They therefore produce Mediterranean fruit crops.

Yugoslavia. Like the other Balkan countries, Yugoslavia is a land of farmers. Approximately 80 per cent of the working population is engaged in agriculture. Yet agriculture is primitive and backward. Corn and wheat are the leading crops. Since all of the interior parts of Yugoslavia have a summer rainfall, corn production is favored. Moreover, corn is a good crop for hilly and poorly prepared land. Wheat, on the other hand, is grown largely on the

plains of northern Yugoslavia. But the lack of modern methods of cultivation is reflected in the low yields—only 12 bushels of wheat per acre. The production of fruit and the raising of livestock are other important activities in the interior and northern areas. Because of rugged land surface the greater part of Yugoslavia is better suited to the grazing of livestock than the production of crops. Thus large numbers of cattle, sheep, and goats find pasturage in the highlands and in many districts hogs feed on acorns of oak forests.

The coastal region of Yugoslavia has a Mediterranean climate—winter rain, summer drought, and abundant sunshine. Here lies the Dalmatian Coastal Region, where numerous little valleys produce Mediterranean fruits such as olives, grapes, lemons, and oranges.

Albania. Albania is one of the smallest of European countries—even smaller than Switzerland—and contains only 1,000,000 people. It consists largely of mountains, with occasional deep valleys. Cattle and horses are raised in the valleys, while sheep and goats find pasturage on the mountain slopes. Most of the livestock products are consumed at home, since Albania has but little trade with other countries. Yet there are some exports of wool, hides, and skins.

As in other parts of the Balkan Peninsula, crop production is confined chiefly to the lowlands. In the little river valleys Albanian farmers produce wheat, corn, tobacco, and Mediterranean fruits, but the yields per acre are low because of their primitive methods of agriculture. Most of the farmers are poor and illiterate, and the greater number are Mohammedans in religion.

Bulgaria. Bulgaria is a land of farmers. More than 80 per cent of the working population is engaged in that occupation. Most of the people live in tiny agricultural villages. Most of the peasants own their farms, and large estates are the exception rather than the rule. The peasant holdings are small, the average farm covering only 15 acres. Moreover, on many farms the fields are widely scattered, consisting of small one- to two-acre patches that are often separated from one another. Under such conditions, the use of large labor-saving machinery is impossible. As in the rest of the Balkan Peninsula, primitive methods of agriculture prevail, and the small Bulgarian farms are just barely self-supporting. In most districts the farmers produce their own food, clothing, implements, and even household furniture.

The major regions. Bulgaria may be divided into four natural regions: (1) the northern or Danube Lowland area, known also as



The natural regions of Bulgaria. The heavily dotted areas are over 1,000 feet in elevation, whereas the lightly dotted areas are below that level.

the Balkan Foreland; (2) the Balkan Mountains; (3) the Rhodope Mountains; and (4) the lowland region of the Marica and Tundza.

The Danube Lowland Region. In the north, Bulgaria shares the valley of the Danube with several of the neighboring countries. Here the climate is continental; that is, the summers are hot and humid, while the winters are cold and dry. During winter, cold winds sweep into the Danube Basin from the interior of Russia.

This northern lowland is the great cereal-producing part of Bulgaria. Here wheat is the leading crop, with corn second in importance. Oats, barley, and rye are also grown, but mainly in the higher and cooler districts.

The Balkan Mountains. Located just to the south of the Danube Lowland, the Balkan Mountains are devoted largely to forests and

pastures. The upper slopes are covered with forests of beech and oak. The most extensive pasture lands are located on the northern slopes of these mountains. These pastures support several hundred thousand sheep and goats, while many hogs feed upon the mast (acorns and similar nuts) of the forests. The south-facing slopes of these mountains are also devoted largely to grazing, but in addition they contain important orchards, tobacco fields, and vineyards.

The Rhodope (Rose View) Mountains. These highlands cover the southern and southwestern parts of the country. Large parts of this highland region are undeveloped, and the mode of life in this region is extremely primitive. Transportation is handicapped by reason of rugged land surface. This is, in fact, the most isolated part of Bulgaria, and most of the inhabitants have but little contact with the outside world. Ancient customs have been well preserved. Here large areas are still forest-covered and wild animals abound. Highland pastures are devoted to the grazing of livestock. Crop production takes place mainly in the scattered valley districts. Nearly all the farm products are consumed at home.

The valleys of the Marica and Tundza. The Marica and Tundza valleys are located between the Balkan and Rhodope mountains and cover the east-central part of Bulgaria. Unlike the Danube Lowland Region, these valleys have dry summers and mild winters.

The Tundza Valley, located just to the south of the Balkan Mountains, is one of the leading producers of roses in the entire world. In fact, this lowland is sometimes called the "Rose Valley." The roses are used in the manufacture of a perfume known as attar of roses. More than one and one-half tons of rose petals are required to make one pound of attar of roses. The perfume is therefore very expensive. Approximately three-fourths of the world's attar of roses comes from this little Bulgarian valley.

The Marica Valley is much larger than the Tundza, and is devoted to a great variety of crops. Here vineyards and orchards are found on the slope lands, while wheat, corn, and tobacco are grown on the plains. This valley constitutes the important center of Bulgaria's tobacco crop, the leading export of the country. Here also mulberry trees are grown, and a silk industry has been developed.

Greece. As we have already seen, Greece is a very old nation. Greek civilization traces back to ancient beginnings and, like Spain and Italy, Greece has enjoyed a glorious past. Here agriculture has had a long and varied history. Yet the present agriculture of

Greece suffers because of primitive methods. Crop yields per acre are low, and the country must import large amounts of food each year. While nations in western Europe have made rapid progress in agriculture, Greece has advanced but little. Political unrest and frequent warfare have greatly retarded development. Moreover, the greater part of Greece is mountainous and dry. At the present time less than one-sixth of the total area of the country is devoted to crops.

Three natural regions may be recognized: (1) the plains, (2) the mountains, and (3) the Aegean and Ionian islands. Of these the plains are most important in regard to crop production. The mountains are sparsely populated and devoted mainly to grazing. The islands are the tops of partly submerged highland areas, and their rocky surfaces are not well suited to cultivation. The island dwellers make a living by means of the sea as well as the land. They have greatly aided the commercial development of Greece.

On the small coastal and river plains, the peasants of Greece have grown cereals, grapes, and olives for at least 2,000 years. At the present time cereals such as wheat, barley, and corn are raised on the plains, whereas much of the country's tobacco is grown along the margins and plains. Citrus fruits, currants, and raisins are also produced in the lowland areas. The currants are obtained from a small seedless variety of grapes, which are dried much like raisins. The sunny Mediterranean climate in the southwestern and southern lowland districts greatly favors the production of currants as well as raisins.

The highlands of Greece are inhabited chiefly by a pastoral population. Large flocks of sheep and goats are grazed on the highland slopes. Greece surpasses all other nations in the number of goats to the square mile of land. Here goats are raised largely for their milk. Goats driven from the mountains to the cities furnish a major part of the milk supply. Migratory flocks of hardy sheep, known as the Vlachican breed, are found in the highlands. They graze in the mountains in summer and in the plains in winter.

Turkey. At present most of Turkey is located in Asia rather than Europe. The country has lost nearly all of its once extensive European possessions. With an area of only 10,000 square miles, European Turkey is only one-fifth the size of Greece. Turkey, like other Balkan countries, suffers because of backward economic conditions and primitive agricultural methods.

The Turkish lowlands are devoted to crops, and the highlands to the grazing of livestock. Of the livestock, sheep and goats are most numerous. The lowland areas are given largely to grain fields, vineyards, tobacco fields, and mulberry groves. The growth of mulberry trees has been associated with the development of the silk industry, which today is an important activity in the lowlands of Turkey.

QUESTIONS AND EXERCISES

- 1 Name the major reasons for the low degree of economic development in Spain.
- 2 Explain the chief uses of the land on the Central Plateau or Meseta of Spain.
- 3 How does farming in Galicia differ from that on the Central Plateau? Why?
- 4 In what ways is the Cantabrian Region important to Spain?
- 5 Explain the economic leadership of the eastern lowlands of Spain. What crops are grown in that region?
- 6 Why are the southern lowlands of Spain less advanced in economic life than the eastern lowlands? What crops are grown in the southern lowlands?
- 7 Why are the average crop yields low in Portugal? What are the chief ways of making a living in that country?
- 8 Read the text on cork production in Portugal, then turn to other sources, such as encyclopedias, and write a 400-word composition on that subject.
- 9 Why are the Italians trying desperately to increase their crop land?
- 10 How do land surface and climate affect agriculture in the Po Basin of Italy?
- 11 In what ways do the western lowlands of Italy differ from the eastern ones?
- 12 Explain the importance of the livestock industry in Yugoslavia. In what parts of the country are wheat and corn produced?
- 13 Name the natural regions of Bulgaria. What part of Bulgaria produces the roses which are used in the making of attar of roses?
- 14 Although Greece is an old nation which has had a glorious past, the present agriculture of the country suffers because of primitive methods. Explain.

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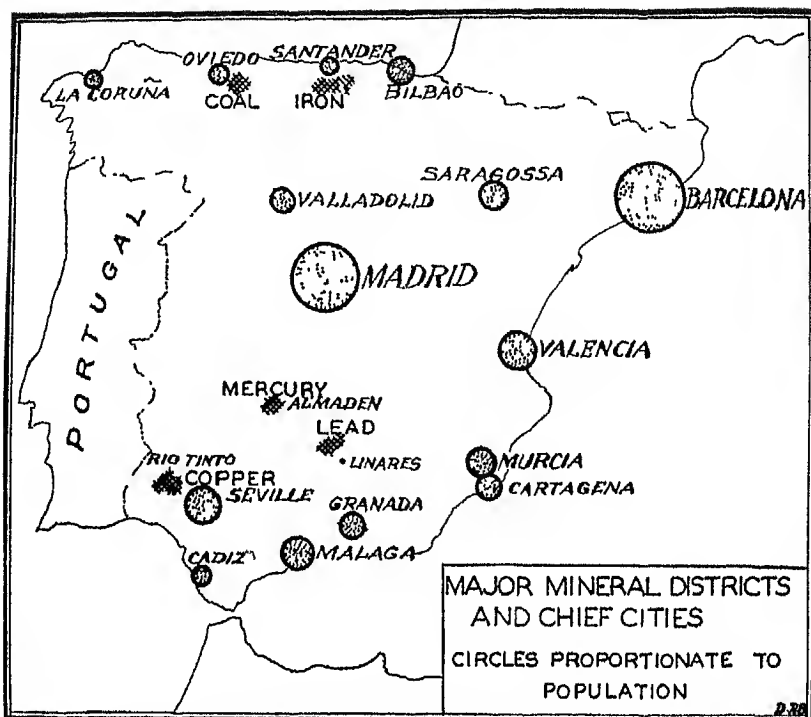
SOUTHERN EUROPE—MANUFACTURING AND COMMERCE

THE IBERIAN PENINSULA

Manufacturing and commerce in Spain and Portugal. In spite of a glorious past and a variety of natural resources, Spain and Portugal are not important industrial nations. Manufacturing provides employment for only a small part of its population—about one-fifth of all the workers. The products of the manufacturing plants are largely used at home. Yet they do not fully satisfy the local requirements, and manufactured goods are imported.

Handicaps to industrial progress. The industrial backwardness of Spain and Portugal is due to a number of factors. (1) For a long period of time these countries neglected manufacturing and world trade, as they were searching for gold and silver in the New World. (2) Centuries of warfare caused loss of wealth and man power. As the mother countries lost colonies, they also lost sources of wealth, such as the precious metals of the Andes Mountains. (3) Political disturbances within the Iberian Peninsula have retarded progress. Bitter political differences at times break out in internal revolution, such as the recent civil war in Spain. (4) The high percentage of illiteracy is a decided handicap to modern industry and commerce. The illiteracy is high in both Spain and Portugal, although fortunately it is being reduced somewhat from year to year. About 43 per cent of the Spaniards and 60 per cent of the Portuguese above the age of 10 are unable to read and write. (5) These countries lack a large middle class, the greater part of the masses consisting of poor people. (6) Finally, the transportation system is still inadequate. Although railways have been constructed across the Iberian Peninsula, many districts are not served by modern means of transportation. Mule trains and ox teams are the only means of transport in some areas.

The textile industries of Spain. The making of cotton goods is the most important type of manufacturing in Spain. Most of the raw cotton used in this industry is imported, chiefly from the United States.



Location of major mineral districts and chief cities of Spain.

In addition to the making of cotton cloth, Spain manufactures wool, silk, and linen textiles. Woolen clothing and wool blankets are used in most parts of the country. The interior highlands are quite cold in winter and most parts are cool at night, even during the summer months. Thus wool products add to the comfort of the inhabitants. Moreover, the country has long been known for its merino sheep—animals that yield an abundance of wool. The silk textile mills are located mainly in the southeastern and southern parts of Spain, the chief centers being Valencia and Seville. Some linen is manufactured in Barcelona and neighboring towns.

Barcelona, the leading textile center of Spain. Barcelona is at present the largest city in Spain, and it is the nation's foremost industrial center (Map above). It has long been one of the most important industrial and commercial cities in the Mediterranean Basin. It is located in Catalonia, the most advanced political province of Spain. Here one finds a progressive population similar to that

of southern France. The inhabitants of this area are known as Catalans, and they have long refused to be called Spaniards.

Barcelona produces three-fourths of Spain's cotton textiles. Several factors have favored the industry. The city has an abundance of skilled labor, access to coal, a plentiful supply of water power from the Pyrenees, and a sufficiently moist climate for the manufacture of cotton textiles.

The mineral industries of Spain. The highland regions of Spain yield a great variety of minerals. During normal years Spain ranks first among the nations of Europe in the mining of mercury (quicksilver), copper, and lead. The world's largest and richest deposits of mercury are found in Spain, chiefly at Almaden in the south-central part of the country. Copper, the first metal known to man, has long been mined in the southwestern part of the country. The lead is mined largely to the south of the mercury-producing district of Almaden. Spain also contains large deposits of coal, iron ore, and zinc.

The iron and steel industry. In spite of large deposits of iron ore and coal, Spain has a comparatively small iron and steel industry. Most of the iron and steel plants are located in the Cantabrian Highlands of northern Spain. Here also are the chief coal and iron mines and the leading iron-exporting ports. Bilbao and Santander are the two chief ports of commerce for this northern coastal region. They also have iron and steel industries. Yet most of the iron ore mined in Spain is exported, chiefly to the British Isles. An iron and steel industry requires large amounts of good coking coal. Although Spain has large reserves of coal, much of it is not suitable for the making of coke. Moreover, the country does not mine enough coal of any kind to satisfy its needs in general, and must import about 1,000,000 tons a year. The chief coal mines of Spain are in the north, near Oviedo.

Handicaps to the mineral industries. Although Spain contains a large variety of minerals, some of them are undeveloped, while others could be mined to a much greater degree. The Spaniards lack the necessary capital with which to develop these industries. Many of the minerals have therefore been mined by foreigners. In the past they were mined by Phoenicians, Romans, and Moors, at present, by the Great Powers of western Europe. The lack of skill and education on the part of many of the people has also been a handicap. As the people become better educated they will become more efficient.



Port of Santander (1936), located in the mineral-producing region of northern Spain (Courtesy Spanish American Society)

in their work and will use the resources more completely. More and more machines will aid human labor and a greater amount of coal and water power will also be used. Such development has already taken place in some parts of Spain, notably in Barcelona.

Manufacturing in Portugal. Like Spain, Portugal has a variety of natural resources. Yet manufacturing is not well developed, owing to backwardness, a high degree of illiteracy, lack of capital, and the poor system of transportation. The country contains various minerals, such as iron, copper, tungsten, and some tin. Unfortunately, Portugal has but little coal, and the nation is therefore handicapped in regard to the smelting and refining of the metals.

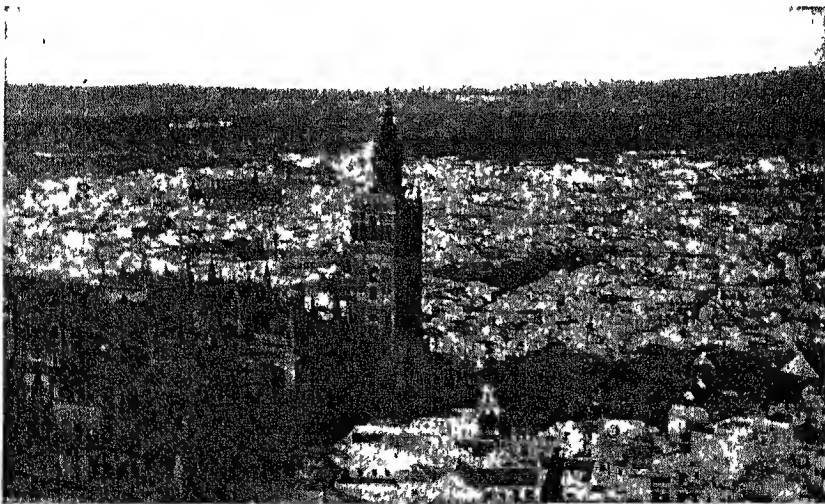
The chief manufacturing industries are those connected with the preparation of wines, olive products, cork products, and textiles. Lisbon and Oporto are the leading industrial centers. Their industries consist largely of textile manufacturing and the preparation of wine.

The foreign trade of the Iberian Peninsula. That Spain and Portugal are not very important industrial nations may be seen in a study of their foreign trade. Manufactured goods must be imported from foreign countries. Such goods make up the greater part of the value of all the imports. The chief exception to this general rule is unmanufactured cotton, which is also one of the leading items of

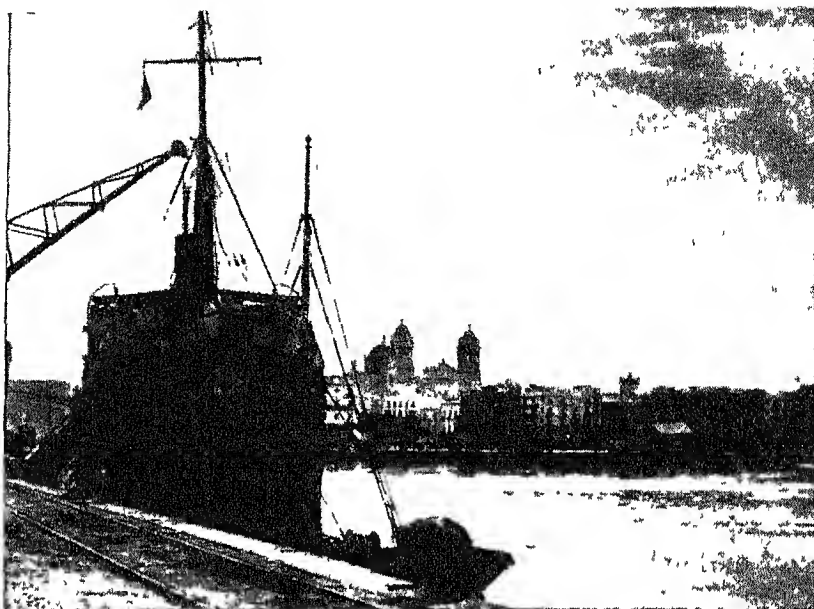
the import trade. Other major items of import consist of manufactured goods, such as chemicals, machinery, automobiles, and metal products. On the other hand, exports consist largely of raw materials and foodstuffs. Among the leading exports of Spain are found oranges, olive oil, wines, and cork. Portugal exports port wine, cork products, and canned fish.

Spain and Portugal trade largely with the United Kingdom, France, Germany, and the United States. Spain normally buys more from the United States than from any other country. The chief item in this trade is raw cotton, which is purchased from our Cotton Belt.

Chief ports. Spain's most important ports are Barcelona, Valencia, Malaga, Seville, Cadiz, and Bilbao. Barcelona handles much of the foreign trade of Catalonia. Its imports consist largely of raw cotton, coal, grain, hemp, and foodstuffs, its exports include fruits, wines, olive oil, textiles, leather goods, and furniture. Valencia is located on the eastern coast of Spain to the south of Barcelona. It is an important fruit, olive oil and silk exporting port. Malaga is located on the southern coast of Spain. It exports fruits, wine, and mineral products, such as zinc and lead. Seville and Cadiz are also located in southern Spain. (Pictures below and next page.) They are old ports that rose to great importance during the period of Spanish power in the



Port of Seville (1936), located on the Guadalquivir River in southern Spain. (Courtesy Spanish American Society.)



Port of Cadiz (1936), southern Spain (Courtesy Spanish American Society)

New World To these ports Spanish galleons brought precious cargoes of gold and silver. Seville is located on the Guadalquivir River. After each rain much silt is washed into this river. Constant dredging of the river is therefore necessary, so that ocean-going vessels may reach the port. Fruits and olive oil are important exports at Seville. Such commodities are also handled at Cadiz. Bilbao is an important exporting center of minerals produced in northern Spain.

Portuguese ports. Lisbon and Oporto are the leading ports of Portugal. Oporto is located at the mouth of the Duro River. It is situated in a great wine-producing region and exports the well-known port wine of commerce. Lisbon is situated on the Tagus (or Tejo) River about seven miles from the Atlantic. The earthquake of 1755 destroyed all but a small part of Lisbon. The greater part of the city has been erected since that time. Unlike most Mediterranean cities, Lisbon is therefore quite modern in character. Yet old practices are found alongside the modern. For example, milkmen drive cows through the city streets morning and evening, and milk them near the homes of the customers.

The harbor of Lisbon is an excellent one. The lower part of the

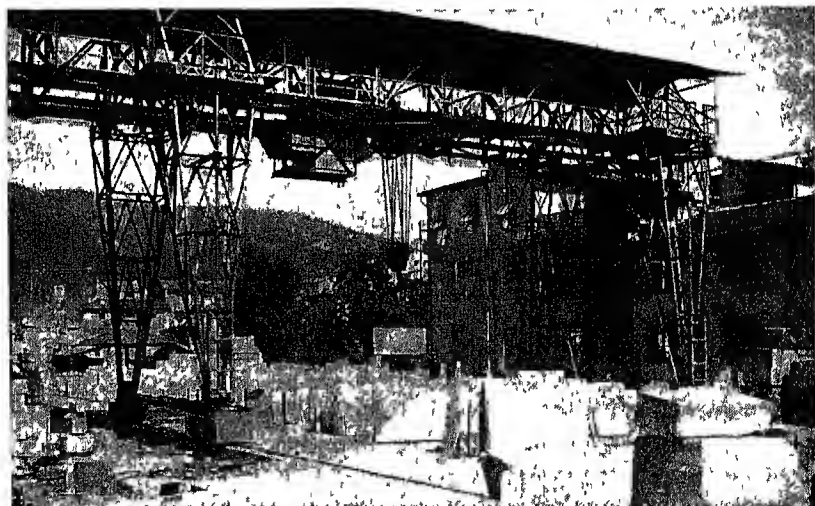
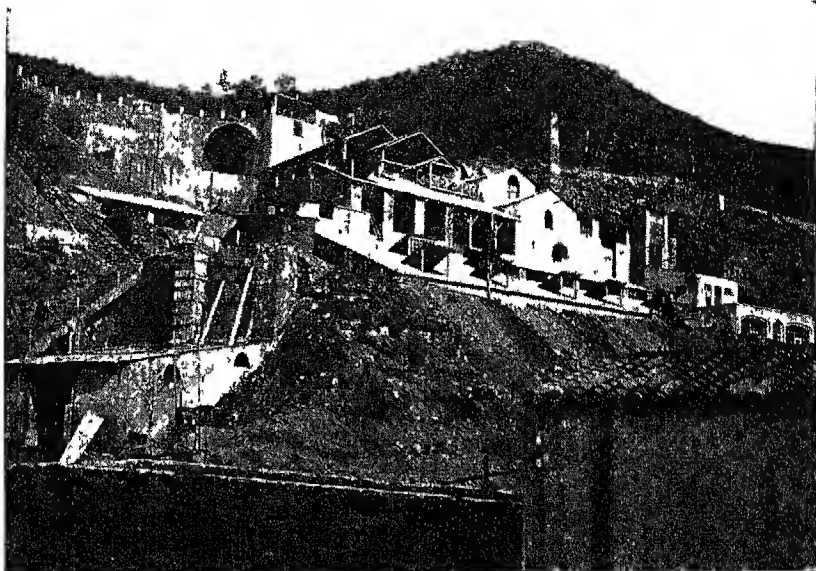
Tagus is narrow near the Atlantic and widens to the size of a small lake just above the city. Thus Portugal has a large, well-protected harbor that is one of the finest in the world. Here ships from many nations may be seen at any time. The chief exports of the city consist of wines, cork products, and canned fish.

ITALY—MANUFACTURING AND COMMERCE

Importance of manufacturing in Italy. Of the various nations of southern Europe, Italy is the most advanced in modern industry. The rapid growth of her population, together with limited land area suitable for agriculture, have made it necessary for many of the people to turn to manufacturing as a means of livelihood. Italy is unable to grow enough food for its large population. Great textile industries and important machinery and chemical works have been developed. Manufactured products help pay for many of the commodities that must be imported. The country has witnessed a remarkable industrial growth, and today nearly three-fifths of all exports are manufactured products. Much of the industrial development has taken place in spite of handicaps.

Handicaps to industrial development. Manufacturing is handicapped by the lack of minerals and other raw materials. Italy's total reserve of coal is less than the amount of coal mined in the United States in one year. Most of the coal used in the country must be imported. Some iron ore is found on the islands of Elba and Sardinia (Sardegna). Iron ore, pig iron, and scrap iron are imported in large quantities. Fortunately, Italy possesses an abundance of sulphur, chiefly in Sicily, and some lead, zinc, and sulphur on the island of Sardinia (Illus, p. 500.) The country has an abundance of excellent marble. The most noteworthy marble quarries are located at Carrara. (Illus, p. 500.) Here marble has been worked for a long time. In fact, at the time of Roman power, Carrara marble was used in some of the buildings. In addition, Italy contains mercury and bauxite (used in making aluminum). Other minerals are either entirely lacking or they are found only in very small quantities.

Italy is also poorly supplied with forests. The largest stands of timber are found on the Alpine slopes in the north. Here the well-distributed rainfall has greatly aided the growth of trees. But most of peninsular Italy is too dry for rapid forest growth. Italy is an



Italy's industrial development has been greatly handicapped by a lack of mineral resources and raw materials. But sulphur and marble are found there in abundance. The islands of Sicily and Sardinia yield valuable supplies of sulphur. Carrara is the ancient seat of marble quarrying. Some of the ruins still standing testify to the use of Carrara marble in early Roman times. *Top*, a sulphur mine in Sardinia. *Bottom*, a Carrara marble quarry. (Courtesy Italian Tourist Information Office.)

old country Here timber has been cut for many centuries. On the dry slope lands of the Italian Peninsula tree growth is very slow, owing largely to the desert-like summers of this area Large quantities of lumber, pulpwood, and paper are therefore imported each year

Three major advantages. Although poorly supplied with natural resources, Italy has three major advantages for the development of industry These advantages are (1) water power, (2) an abundance of efficient yet cheap labor, and (3) a favorable location

Hydroelectric power. To make up for the lack of coal and petroleum, Italy has made good use of water power. In hydroelectric power, Italy now leads all other European countries. But unfortunately the best power sites have already been taken, and comparatively little water power remains for further development

More than three-fourths of the electric power is generated in northern Italy, chiefly in the basin of the Po The Alps Mountains continue from Switzerland southward to the Po Valley On these northern Alpine slopes of the Po Basin the rainfall is heavy and well distributed, the slopes are steep, and forests prevent rapid run-off Moreover, this region contains a number of lakes which help to regulate the flow of the streams. Because of these factors the streams which flow from the north into the Po River furnish an abundance of well-distributed power. Partly because of this supply of power, the Po Valley has become Italy's foremost industrial region

An excellent labor supply. The inhabitants of Italy are substantial, energetic, and progressive They show the smallest percentage of illiteracy of all other Mediterranean peoples, and large sums of money are being spent each year in order to stamp out illiteracy But Italy is a land of many people and few valuable resources Land and resources are scarce, people are plentiful By reason of the abundance of this type of labor the wages are low.

A favorable location. A central location in the Mediterranean Basin has long been an advantage to Italy During the Middle Ages it meant a great amount of trade for such Italian cities as Venice and Genoa. At the present time Italy is the leading industrial nation in the Mediterranean Basin. It therefore sells manufactured goods to other Mediterranean countries located to the east, west, and south To the north it has contacts with western continental Europe by way of Alpine passes and tunnels. From the north Italy obtains industrial raw materials. But most of the raw materials reach the country by way of ocean rather than land transportation Situated on the

Mediterranean trade route, Italy is easily reached by ships that ply between western Europe and the Orient

The textile industries. Of all the major manufacturing groups in Italy, the textile industries are the best developed and the most important. In no other industrial group are there as many workers, and no other industry uses as much electricity as is used by the textile group of industries. These industries also lead in value of manufactures

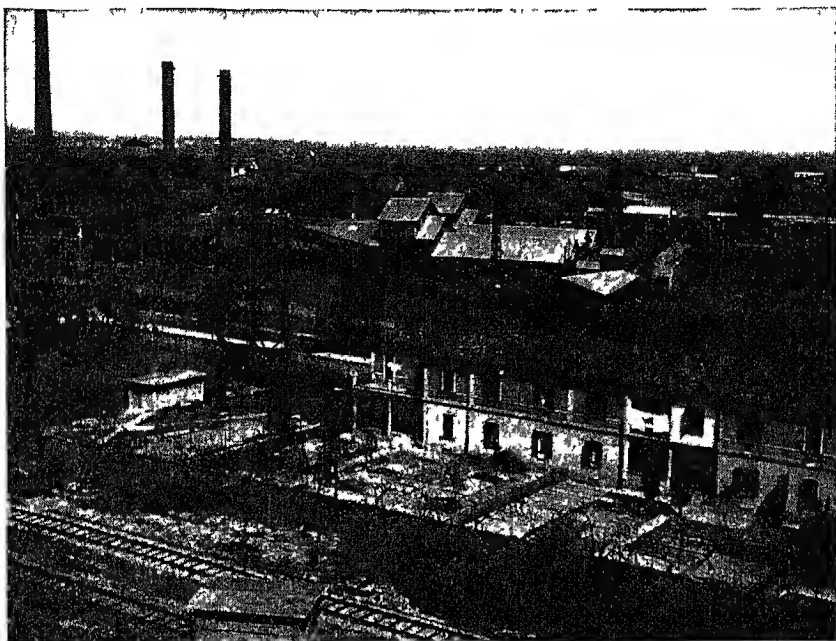
Italy's cotton textiles The making of cotton cloth is the most important of the textile industries in value of finished product and in number of workers. Yet almost all of the raw cotton is imported, chiefly from the United States. Cotton cloth is normally one of the leading items of the export trade

Silk, wool, and rayon textiles The woolen and silk industries are based in part upon the domestic production of raw material. Of all European countries Italy leads in the production of raw silk. Thus the silk textiles industries are based largely upon the use of domestic raw silk. There are not sufficient numbers of sheep, however, to satisfy the requirements of the wool industry, and most of the raw wool must be imported. In the production of rayon Italy leads all European countries and ranks next only to the United States in world production. Large quantities of wood pulp are used in the rayon industry. This raw material is obtained largely from northern Europe.

Other textiles In Italy there is also a production of fabrics in which hemp and jute are used. Hemp is grown in Italy and satisfies their demands for this fiber. But jute is imported from India, the world's leading source of that fiber.

Location of textile industries Italy's textile industries are located mainly in the northern part of the country. The northern part, especially the Po Basin, has an abundance of water power and skilled labor. Here also the local markets consume a large part of the textile output of the country. Moreover, raw materials such as wool, silk, and hemp are produced in the Po Basin. The city of Milan (Milano) is the leading silk center of this region and one of the chief silk-manufacturing cities of Europe. Woolen goods are produced in Turin (Turino). Cotton goods are made in a number of cities in the Po Valley, but they are also produced in other parts of Italy, notably in the areas along the western coast.

The metal industries. Italy's development of metal industries



Iron works in the lower Po Basin near Venice. The Po Basin is Italy's most highly industrialized region. (Courtesy of Italian Tourist Information Office)

on a large scale has taken place chiefly since the World War. The country is handicapped in this type of manufacturing because of the small reserves of coal. Moreover, the coal is of low grade and is not suitable for the making of coke. Because of the lack of coking coal and the small reserves of iron ore, the country's pig iron output is small. Yet the manufacture of steel is relatively important. The steel industry is based largely on imported pig iron and scrap iron. It also consumes large amounts of coal and hydroelectric power. The coal is imported chiefly from Great Britain and Germany, whereas the hydroelectric power is produced locally.

Location of steel industries. Steel is made in a number of places, notably in the northern cities of Turin and Milan. But various of the centers in the west-coast region also produce steel. Naples (Napoli) has some iron ore and a fair supply of water power. It also is conveniently located for the importation of coal. Farther to the north in this west-coast area lies the isle of Elba, which contains iron ore. Thus the steel industry is scattered, but the best development is found in the north.

The manufacture of machinery, automobiles, and ships Much of the steel is used in the making of machinery, chiefly for the textile factories. But even greater quantities of steel are consumed in the manufacture of ships and automobiles. In the making of armorplate for battleships much nickel steel is used. Nickel is obtained from Canada and New Caledonia. In the shipbuilding industry Italy surpasses all the other countries of the Mediterranean Basin and ranks among the six leading nations of the world. Italy manufactures a sufficient number of automobiles for her local markets and some for the export trade.

The automobile and machinery industries are found chiefly in the Po Basin, where Turin and Milan are the leading centers. The west-coast city of Genoa (Genova) handles most of the coal used in the manufacturing centers of the Upper Po Basin. Fortunately, this basin has an abundance of water power, which in part compensates for the lack of coal.

Italy's foreign trade. Located midway between the eastern and western ends of the Mediterranean Sea, Italy has long enjoyed the position of an important trading nation. Yet the country's foreign trade in the past was greater in relation to the rest of the world than it is today.

During the Middle Ages the foreign trade of Venice and Genoa reached great heights. These cities derived enormous wealth from the crusades by furnishing supplies and food. When armies of crusaders were unable to pay for such commodities, they became the debtors of Venice and Genoa. The Italian cities availed themselves of these armies in establishing—often by force—trading posts in the eastern end of the Mediterranean Sea.

Exports and imports. At the present time Italy is surpassed by the nations of western Europe in per capita trade. Yet Italy may be compared with these nations, in that manufactured goods rank as the leading items of the export trade, whereas raw materials and foodstuffs are the chief items of import.

The chief markets for Italian exports in order of importance are Germany, the United Kingdom, the United States, and France. These countries also lead in regard to Italy's imports. The most important import from the United States is raw cotton. The leading exports to the United States include cheese, olive oil, raw silk, fruits, and nuts. Italy normally buys more from us than she sells to us.

INDUSTRIAL AND COMMERCIAL LIFE IN THE BALKAN COUNTRIES

Handicaps to progress. Although the Balkan countries at one time enjoyed an important place in the commercial world, that is no longer true. In manufacturing, these countries are even less developed than the Iberian Peninsula. In most parts of the Balkan Peninsula modern manufacturing has made only small beginnings, most of the inhabitants are engaged in agriculture. Because of the lack of modern industrial development, manufactured goods are the chief items of import. Like manufacturing, commerce is also poorly developed.

These backward conditions of manufacturing and commerce are due largely to political unrest, poor transportation, lack of capital, small amount of coal, and widespread illiteracy. Fortunately, some progress has been made in the Balkan Peninsula within recent years. One of the most hopeful signs of improvement has been witnessed in Turkey, through the establishment of greater political stability. That country had long caused anxiety among the nations of the Balkan Peninsula.

QUESTIONS AND EXERCISES

- 1 The manufacturing industry of Spain is not well developed, especially when compared with that of west-European nations. Explain.
- 2 Explain the importance of Barcelona as a textile-manufacturing center.
- 3 In spite of large deposits of iron ore and coal, Spain has a comparatively small iron and steel industry. Explain.
- 4 Why is manufacturing poorly developed in Portugal?
- 5 Explain the foreign trade of the Iberian Peninsula.
- 6 Name the major ports of Spain and Portugal. Indicate the region that is served by each port.
7. What are the handicaps to industrial development in Italy?
8. Why has the Po Basin become the most highly industrialized region of Italy?
- 9 What are the advantages and disadvantages confronting Italy's metal industries?
- 10 What is the present condition of the manufacturing industry in the Balkan countries of Europe?
11. A large part of Italy's foreign trade is with other European countries and with the United States. What commodities does she obtain?

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EASTERN EUROPE— GENERAL CHARACTERISTICS

Lands of eastern Europe. The greater part of eastern Europe belongs to Russia. But Poland and Rumania are similar to Russia in more ways than one, and should also be included in our treatment of eastern Europe. A large part of northeastern Rumania belonged to Russia before the World War, and the eastern part of Poland was also Russian territory. Poland and Rumania are transition lands. For example, in its western part Poland resembles eastern Germany, and therefore reflects the influence of industrialized western Europe. Rumania is also a transition area. To the east lies Russia, to the south and southwest the Balkan Peninsula, and to the west lies Hungary. Western Rumania was at one time a part of Hungary.

Agriculture the major occupation. In eastern Europe agriculture is the most important occupation. Yet much attention is also given to other extractive industries, such as forestry and mining. Eastern Europe is therefore an important source of industrial raw materials and foodstuffs. There is accordingly much trade between eastern and western Europe. The highly industrialized west offers manufactured goods in exchange for the grain, the timber products, and minerals of the east.

The great majority of the working population of eastern Europe is employed in agriculture. More than 75 per cent of the workers are engaged in that occupation.

Occupied mainly by Slavs. Eastern Europe is occupied almost wholly by Slavs. Here the influence of Asia has long been felt. One wave of migration followed another, as Asiatic peoples moved westward into Europe. The most recent of these migrations has been experienced in eastern Europe. Moreover, large areas in eastern Europe have been retarded in their development because of poor transportation and lack of contact with the more highly advanced civilizations of the world. Many of the people have received but little schooling, and large areas suffer because of backward conditions. Yet the Slavs are a capable people, and in recent years they have made steady progress in all types of work, especially when given

the opportunity of an education. Slavs of the upper class have long demonstrated their ability in science, literature, and the arts.

Mainly a region of plains. Eastern Europe is a land of extensive plains. Here the vast lowland of Europe reaches its greatest width. The varied relief so characteristic of western and southern Europe is found only in some parts of this region. Thus agriculture has had considerable room for expansion, and the level land surface has made it possible to use large labor-saving machines. But in the greater part of eastern Europe such machines are lacking, since the poor peasants are unable to buy expensive equipment. Most of them still cling to an extensive and rather backward type of agriculture. The yields per acre are in general much lower than in western Europe. It is mainly because of the great extent of farm land that eastern Europe holds a high position in the production of crops.

A continental climate. Unlike western Europe with its mild winters and cool summers, this eastern region has a continental climate. There is a great range in temperature from winter to summer in this interior region. Moreover the rainfall is much lighter in the eastern part than it is in the western part, because the westerly winds lose much of their moisture before they reach this eastern region.

EUROPEAN RUSSIA

A large producer and consumer. Of all the world's nations, Russia is the largest. It is more than two and one-half times as large as the United States. It consists of land in Asia as well as in Europe, the Asiatic part being the larger. Russia in Asia stretches from the Ural Mountains eastward across the entire northern part of the continent. The European part of Russia is nearly as large as all the rest of Europe. By reason of its tremendous size, Russia stretches across several types of climate, and contains a variety of soils, minerals, and other natural resources. It is one of the large producers of economic goods, although most of the things produced are consumed by its own people. Moreover, many of its resources are not fully utilized, and give promise of future development.

How Russia grew. For a long period of time the Russians were an inland people. They lacked contact with the sea, and they also lacked direct land contacts with the more highly civilized parts of

Europe and Asia They occupied a part of the great Russian Plain in Europe, yet their chief contacts were with Asiatics rather than Europeans. They were frequently troubled by invading tribes of Asiatic nomads, who were always inclined to pillage and plunder when dry periods caused a shortage of pasture and water The people living on the plains were an easy target for the wild nomads of the steppes and deserts of interior Eurasia The Russians then organized a centralized military government in order to protect themselves against further ruin by barbarous hordes That government, with the aid of capable leaders, was not only able to check the nomad invasions, but also made it possible for Russia to extend its area from the Baltic Sea on the west to the Pacific on the east They acquired land in all directions, and whole river basins were taken, one after another, as Russian political power spread across the great land mass of Eurasia

Although the old Russian government was powerful, it also had its weaknesses. It did not enable the development of a large middle class, such as we have in the United States Most of the people were poor, illiterate peasants More than four-fifths of the inhabitants could neither read nor write

The development of the Soviet Union. The discontented masses of poor peasants finally rose up against their rulers and the nobility in the Russian Revolution of 1917. The old Russian Empire of the Czar crumbled Out of the western part were formed independent republics, such as Finland, Estonia, Latvia, and Lithuania. Eastern Poland and northeastern Rumania were also Russian areas before the World War The remainder of the empire broke up into a number of loosely connected units, known also as "republics." The latter finally united to form the Union of Soviet Socialist Republics (U.S.S.R.) It is also called the Soviet Union Each part of the Union is governed by a committee of workers, known as a soviet. Each sends its representatives to Moscow, the capital city and the seat of the All Union Congress. In practice, however, the Soviet Union is under the control of a comparatively small number of leaders.

Occupations and population. A country that is blessed with abundant and varied natural resources is able to support a large population European Russia has the largest population in Europe. Here, as in prewar days, agriculture is the leading occupation. It is the basis of livelihood for three-fourths of the population. Those

engaged in manufacturing and commerce make up the next largest group. Most of the remaining workers are engaged in transportation, and in the forests and mines. Still others render personal and professional services.

The agricultural population. According to recent population estimates European Russia has an average population density of about 60 per square mile; but the density varies from place to place. Since most Russians are engaged in agriculture, the areas that possess the better climate and soils for crop production have the greatest population densities. In some parts of the Black Earth Region of southern Russia there are more than 250 people to the square mile of land, whereas the dry steppe lands located to the north of the Caspian Sea contain less than three people per square mile. Between these extremes there are all gradations in population density.

Agricultural handicaps. Although agriculture is the dominant occupation, Russia has long suffered because of low yields, and occasionally large areas have experienced famines. Russian agriculture should therefore be considered in the light of certain factors such as: (1) climatic handicaps, (2) isolation and unfavorable transportation conditions, (3) a faulty land system, and (4) increasing pressure of population on land and resources.

Climatic handicaps. Large areas of land in European Russia are rendered unproductive because of extreme cold and extreme drought. The northern part of the country is the land of tundra and the southeast consists of desert and steppe. Moreover, even the humid regions of Russia have in general less than 30 inches of rainfall a year. By way of comparison, we note that the greater part of eastern United States receives from 30 to 40 inches a year. For example, Cincinnati, Ohio, has an average yearly precipitation of 38.4 inches. Western Europe also surpasses Russia in amount of rainfall. Some of the Russian areas also have an unreliable rainfall. Humid years are followed by periods of drought.

Unfavorable conditions of transportation. Many of the inland districts of Russia have long suffered by reason of isolation. Large areas are located far from the sea, and Russia has struggled hard to obtain a good ice-free port. A long overland journey also means high transportation costs before crops can reach foreign markets. Thus isolation and remoteness have retarded development.

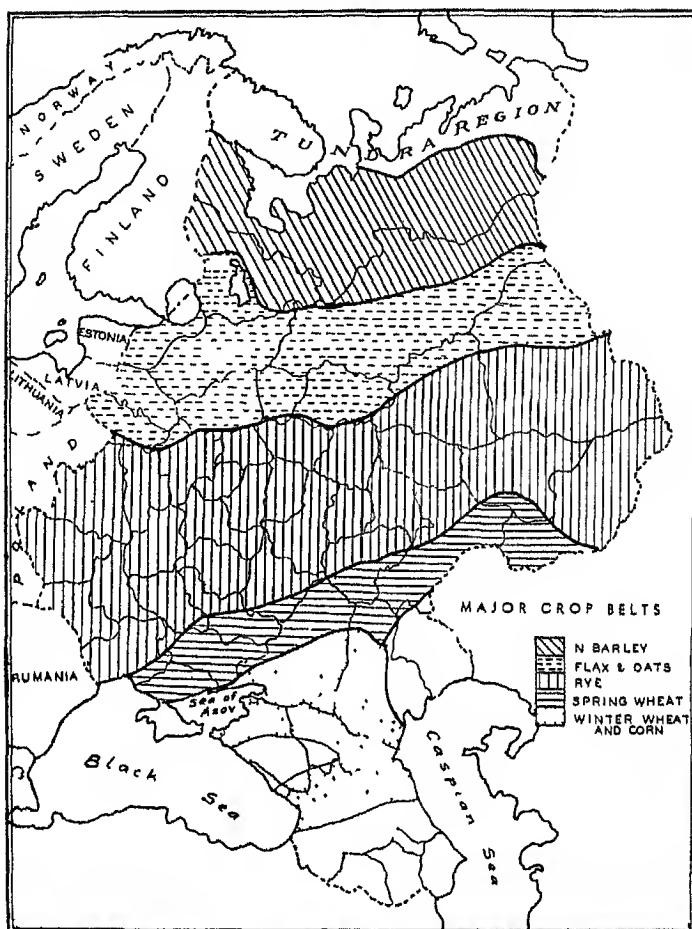
The land system. A faulty land system has greatly hindered progress in agriculture. Prior to the Russian Revolution more than one-half of the nation's land was held by the nobility and the landed

gentry. Nearly one-third of the land was operated under communal ownership, or the farm village settlement, known as the "mir." Under this system, patches of land assigned to a certain peasant family might be taken away at any time and assigned to someone else. Interest was centered in immediate returns. In most cases it was a matter of soil robbing, since the peasants tried to get as much as possible out of it without applying the necessary fertilizers. The peasants were but little interested in maintaining the fertility of the soil. Less than 4 per cent of all Russian farmers owned their own land.

After the Russian Revolution attempts were made to make all land national property. The peasants objected, however, and the country's agricultural output declined sharply. Yet large state farms have been developed and some of them exceed 100,000 acres each. They are used as experimental units and demonstration farms. Most of the agricultural holdings of Russia, however, are known as collective farms. Under this system many farmers unite their holdings, making it easier to work them with large labor-saving machines. Expert advisers and modern machinery are provided by the government. Some progress in agriculture has been realized; but in spite of the increased acreage and returns, the yields per acre in Russia are still among the lowest in Europe.

Increasing pressure of population. The constant increase of population in Russia has not been matched by a corresponding increase in crop land and yields. Industries have been developed, cities have grown in size, and mining centers have been established in a number of places. Such development of nonagricultural areas has caused a greater demand for food. The rural population is also becoming larger from year to year. More than three-fourths of all the people are classified as agricultural, as compared with less than one-fourth in the United States. Moreover, only one-fourth of European Russia is devoted to crops, most of the remainder being forest land, arid land, and tundra. There is consequently little land for each family, in spite of the large state and collective holdings. To an ever increasing extent Russians are consuming their agricultural products at home. In fact, Russia occupied a relatively more important place in the export of crops before the World War than she does at the present time.

The major crop belts. Look at the illustration on page 512 and you will notice the major crop belts of Russia. Within these belts certain crops predominate in the cropping system. That does not



Major crop belts of European Russia. The southernmost of these belts—the Winter Wheat and Corn belt—also contains districts in which barley is one of the leading cereals. (Adapted from Olaf Jonasson's "Agricultural Regions of Europe." Courtesy *Economic Geography*.)

mean, however, that other crops are lacking. For example, the Oats and Flax Belt produces not only oats and flax but also barley in its northern part and rye in the south. But oats and flax are the chief crops of this belt. Similarly, the Rye Belt produces considerable quantities of oats and flax in its northern part and spring wheat in the south. Yet rye is the distinctive crop.

The Northern Barley Belt. This region consists largely of scattered clearings in the Northern Coniferous Forest of Russia. This forested region is located just to the south of the Tundra. It is a region of short summers and possesses gray forest soils, known as podsol. Less than 5 per cent of the land is devoted to crops. The crop land consists chiefly of hay, hardy cereals, and tubers (root crops). Northern or dark-colored barley is the most important of the cereals, since it reaches maturity within a comparatively short period of time. In Europe the barley is the northernmost of all the cereals, just as in South America it is grown in the cool climate of Andean mountains and plateaus.

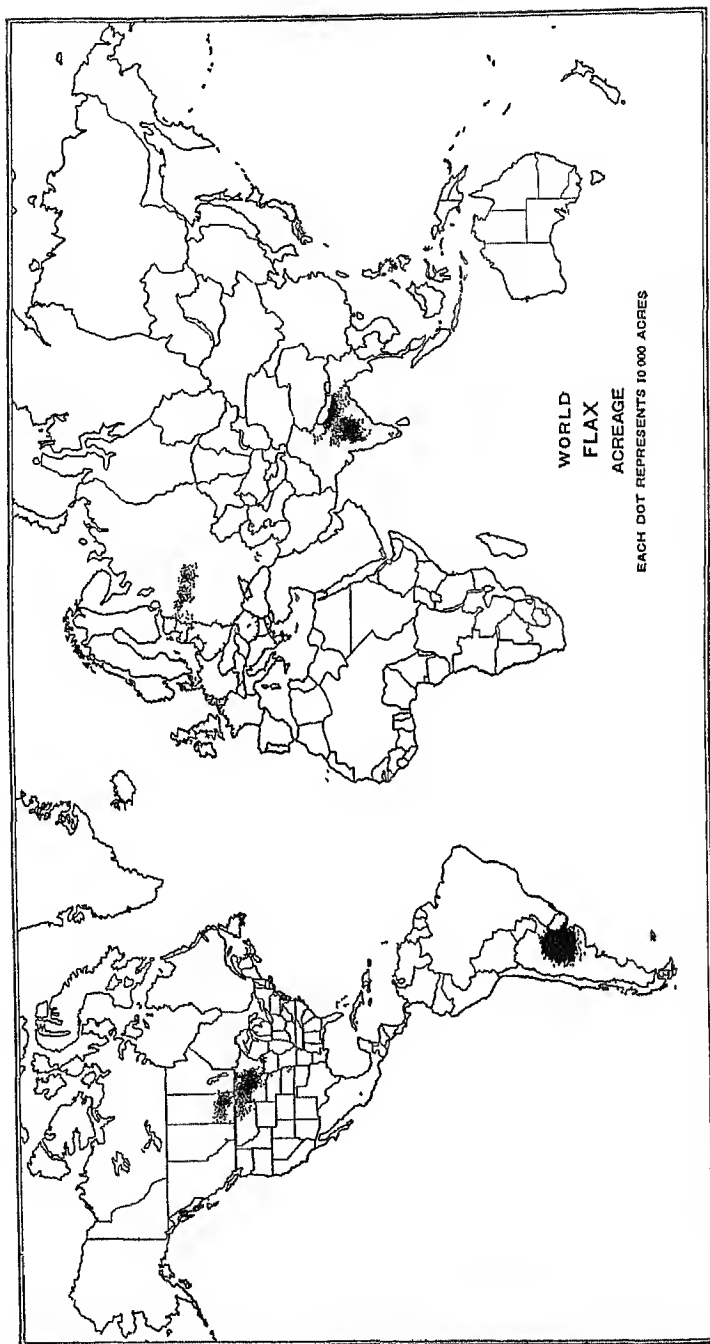
The Oats and Flax Belt. As shown in the map of the crop belts, the area of maximum production of oats and flax is located to the south of the Northern Barley Belt. This region has cool to mild summer temperatures, moderate rainfall and cloudiness, and moderately high humidity—climatic conditions that favor the production of oats and flax.

Look at the illustration on page 514 and notice the distribution of flax. Russia is one of the four leading producers of flax in the whole world, the others being the United States, Argentina, and India. In all these countries flax is grown for its seed, but only Russia is the major source of flax fiber, which is used in the making of linen.

The Rye Belt. The area of maximum production of rye occurs in a long east-west-trending belt in the central part of Russia. The greater part of this region was originally forest covered. Broad-leaved trees predominated. The soils are grayish-brown in color. But the southern part of the region contains native grasslands and black soils that are well supplied with humus. Most of the land of the Rye Belt is now under cultivation.

Rye ranks second in acreage among the crops of Russia, being surpassed only by wheat. In the Rye Belt the winters are too severe for fall-sown wheat, and spring wheat gives more abundant returns on the black soils of the regions located to the south of this belt. The large population demands a cereal for food. Rye meets this demand in part through the large yields obtained under the soil and climatic conditions of this area. Russia has long been the leading producer of rye in the world.

Great quantities of sugar beets are also grown within the Rye Belt, mainly in the western part. Russia has become an outstanding producer of both of these crops.



The world flax acreage Note the four leading producers (Adapted from U S Dept of Agriculture map)

The Spring Wheat Belt. To the south of the Rye Belt, one finds the vast expanses of native grasslands. Here the precipitation is lower and the southern position means greater evaporation than in the northern regions. It is therefore a region of grasses rather than forests, since trees require more moisture. Throughout the ages the decaying grasses have added large quantities of humus to the soil. This region, in fact, contains fertile black soils, and it is often called the Black Earth Belt of Russia. The western part of the region is located in the Ukraine.

The Soviet Union ranks first among the nations of the world in total wheat acreage and yields. Nearly half of her 1,000,000,000 bushel wheat crop is grown in the Spring Wheat Belt. Moreover, this region produces a surplus. It is Russia's leading source of grain exports.

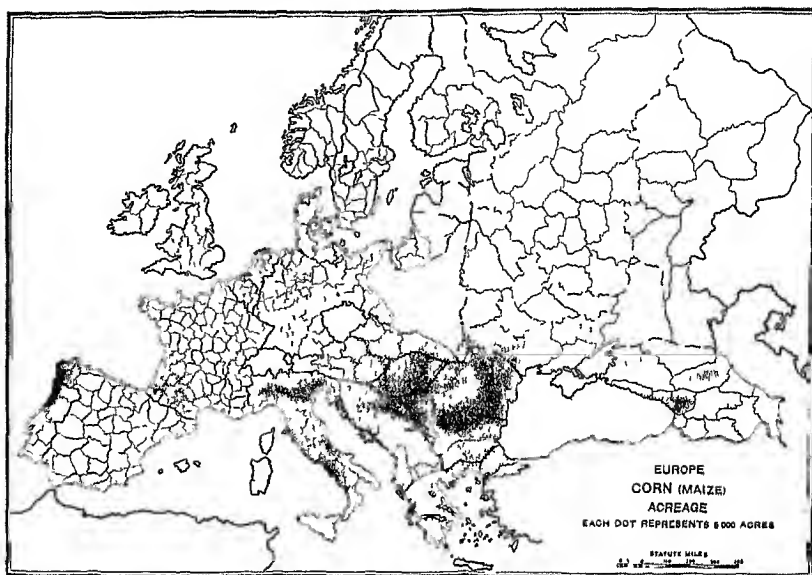
Within the western part of the Spring Wheat Belt, Russian peasants also grow large quantities of sugar beets. Much land is also devoted to barley and tobacco.

Corn and Winter Wheat Belt. Farther to the south the winters become sufficiently mild for the production of fall-sown or winter wheat. Although the winter temperatures are so low that the crop lies dormant during that period, there is but little winter killing.

Corn and barley are other important crops of this region. Most of Russia's corn is grown here. Look at the illustration on page 516 and notice that the other leading corn-producing areas of Europe are located in approximately the same latitude as this area.

The livestock industry. Some livestock are raised in all the crop belts of Russia. The country ranks among the four leading nations of the world in number of sheep and cattle. Sheep of the fine merino breed are pastured on the semiarid and arid lands of the southeast, although these animals are also raised in all of the agricultural regions. But there is considerable room for improvement of Russian livestock, the animals generally being inferior to those of western Europe. Attempts are being made to introduce better breeds of dairy cattle, sheep, and hogs.

Forests and forest industries. Of all the nations of the world, the Soviet Union has the most extensive forests. But the larger part of this forested area is located in Siberia rather than in Europe. Yet European Russia's forests exceed the combined forested area of all the other nations of Europe. They cover approximately 440,000,000 acres, and are distributed as shown in the illustration on page 517.



Corn acreage of Europe Here corn is grown largely to the south of the fiftieth parallel. Note the importance of northwestern Iberia, southwestern France, the Po Valley, Hungary, northeastern Yugoslavia, Rumania, and southern Russia (Adapted from U S Dept of Agriculture map)

Although forested districts are widely scattered, there are two major areas of distribution of trees in European Russia. The first and by far the largest of these is located in the north, just to the south of the Tundra. It is the Northern Coniferous Forest, one of the largest in the world. Here more than 65 per cent of all the land is forested, while the remainder is occupied by lakes, swamps, waste areas, and crop land. The other major forest region is located in the area of the Caucasus Mountains. Here the forests furnish a large variety of highly valuable trees, beech and oak being the most important. Yet for Russia as a whole, evergreen trees, such as the pine, fir, and spruce, cover more than 88 per cent of the total forested area.

Although the forests of Russia are extensive, they have been but slightly used. The low degree of utilization has been due largely to (1) poor transportation, (2) unstable political conditions, (3) lack of necessary capital, and (4) the poverty and therefore low purchasing power of the masses.

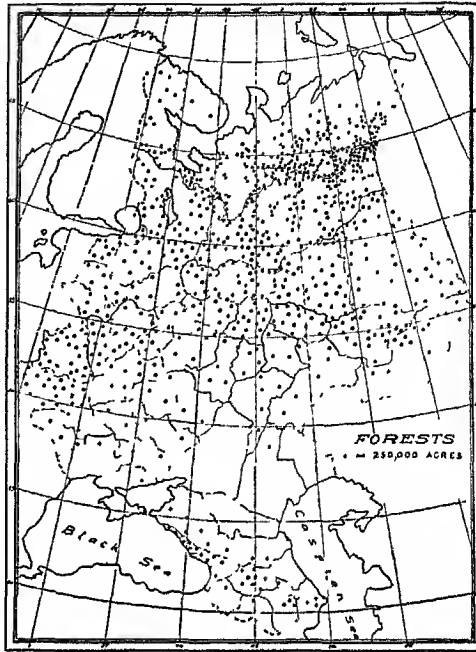
With such vast forest resources, it is clear that a large number of people will find employment in the forest industries. At the

present time many of the farmers supplement their agriculture of summer with work in the forests and the lumber mills in the winter. Many workers also find employment throughout the year in Russia's forest industries, and forest products constitute the leading item of export

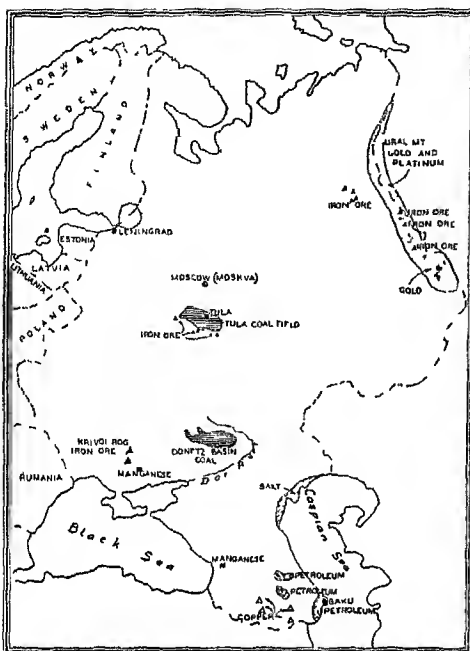
Population engaged in hunting. The wild animal life of Russia is very abundant, and there are many people engaged in hunting. But most of these people are not employed as hunters the year round. Many of them are peasants and lumbermen who hunt in their spare hours during winter. Raw and dressed furs have long ranked among the leading exports.

They are obtained in large quantities in the northern evergreen forests of Russia.

Mineral resources. Of Russia's varied mineral wealth, petroleum, coal, iron ore, manganese, and platinum are especially important. Southeastern Russia contains the most important oil fields in Europe. Here the Baku Oil Field, located west of the Caspian Sea, is the chief producer. Much of the oil is shipped to western Europe, an area that lacks this mineral. Only the United States surpasses Russia in the production of petroleum. The largest and best coal reserves of European Russia are found in two major areas: (1) the basin of the Don River, known also as the Donetsk Basin, and (2) the Tula District located to the south of Moscow (Illus., p. 518.) There are also two major areas with respect to the distribution of iron ore. The most important of these is the Ukraine Region of southern Russia. The other is the Ural Mountain Area, which contains scattered de-



Forest acreage of European Russia. Most of Russia's forests are in the northern part of the country, although the Caucasus Highland Area in the south is another region of concentration of timber.



Some major mining districts in European Russia. Study carefully the location of the chief coal, iron ore, manganese, petroleum, gold, and platinum deposits. Note also the location of important salt works to the northwest of the Caspian Sea.

posits of iron ore. In the output of manganese, Russia occupies a distinctive place among the nations of the world. She ranks first in the production of this mineral, which is widely used in the making of steel. India is the other major source of manganese, and generally ranks next to Russia in production. Russia is also the chief source of platinum, a precious metal that is more valuable even than gold. Platinum is mainly used in the making of jewelry. Russia's platinum is found chiefly in the Ural Mountain Region. Colombia, in South America, is Russia's chief competitor in the production of this precious metal.

Manufacturing. As late as the last quarter of the nineteenth century Russia was confined to the casual home industries in which the peasants were engaged during the winter months when their agricultural work was at a minimum. Such home or cottage industry was sufficient for the peasants, who lived a very simple life and had an extremely low purchasing power. The needs of the nobility were satisfied with imports from abroad. The few existing factories were unimportant and followed rather primitive methods. Toward the close of the 19th century, foreign businessmen built factories and opened mines. By the beginning of the World War there was a sprinkling of modern factories in some parts of the country. But the World War and the Russian Revolution of 1917 nearly wiped out this industry. Thus modern industry in Russia is very young.

Since the Russian Revolution, notable progress has been realized

in the heavy industries, such as the manufacture of pig iron, steel, and machinery. Most of these products are consumed at home

Major industrial areas. European Russia contains three important industrial areas: (1) the Moscow Area, (2) the Donetz Basin, and (3) the Ural Mountain Region.

Of these, the Moscow Area is most important in textile manufacturing. Here linen, woolen, and even silk goods are manufactured. The region has a favorable climate, skilled labor, and available power. Moscow, one of Europe's largest cities, provides an abundant supply of labor and is an excellent market for manufactured goods. It is centrally located with respect to the rest of European Russia.

The Donetz Area is the Pittsburgh of Russia. For four main reasons this area is important in the manufacture of iron and steel: (1) nearness to high grade iron ore, coal, and manganese; (2) existence of the large market area of southern Russia, especially the Ukraine, (3) excellent transportation contacts with the rest of European Russia, and (4) nearness to the coal-deficient Mediterranean countries, which may be reached by way of the Black Sea.

The Ural Mountain Region is important because of its varied mineral industries. Here are treasures of platinum, gold, precious stones, iron ore, nickel, copper, and asbestos.

Transportation. Before the introduction of railways, rivers and canals were the chief means of transportation in Russia. As the Russians moved into undeveloped parts of the country, they followed the waterways, and in most cases settled in the river valleys. Rivers are still an important part of Russia's transportation system. But the waterways are unsatisfactory routes, since they are closed by ice for a considerable period of time each year. They are also crooked, and during dry periods they are too shallow. Moreover, many of the large rivers of Russia flow northward, that is, into the cold, commercially unimportant arctic area, and the Volga empties into the landlocked Caspian Sea.

Railway transportation has to a considerable extent replaced the waterways. Yet large areas are still located a considerable distance from a railway. In proportion to area, Russia has a small railway mileage, and the lack of transportation prevents the use of land in many parts of Russia.

World trade of Russia. In spite of Russia's tremendous area and population, her foreign trade is small. It is normally much less than

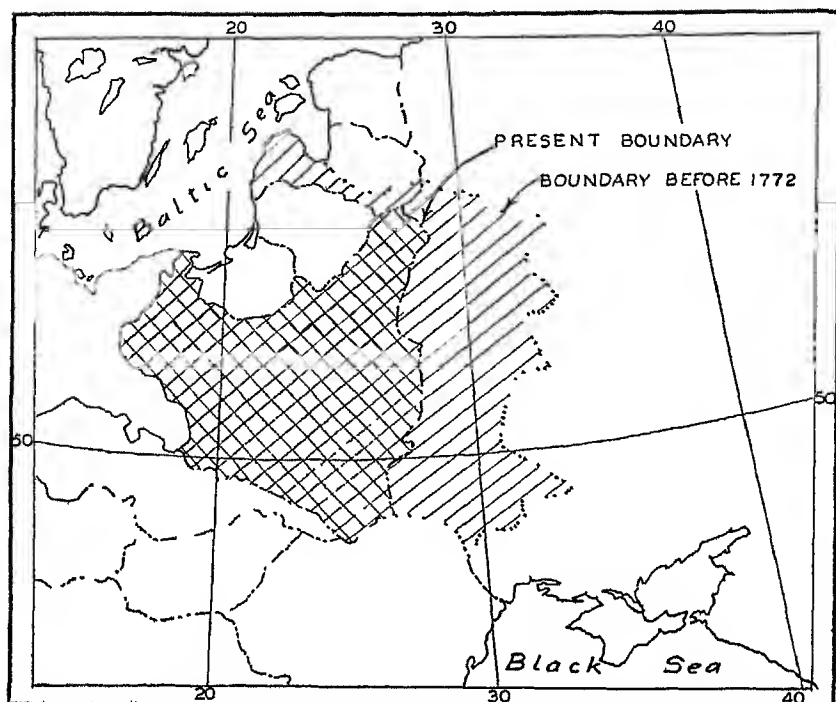
that of small European countries, such as the Netherlands and Belgium. Deficiency of transportation routes and the lack of favorably located ice-free ports help explain this small trade, but there are also other reasons. The vast extent of the country with its great variety of natural resources makes it possible for the Russians to satisfy their requirements largely by means of local or domestic production. Moreover, the poverty of the masses has prevented large purchases abroad. Their per capita foreign trade is one of the lowest in Europe. A small per capita trade is due largely to the low productive capacity of the average worker, who therefore has a low purchasing power.

The trade, though small, is of importance in the commercial world. The leading exports are wood products, petroleum products, furs, wheat, and flax. The major imports consist of machinery, iron and steel, raw wool, and raw cotton. Russia trades largely with Germany, the United Kingdom, the United States, France, and China.

POLAND

Historical importance of Poland's location. Situated on the great lowland plain of Europe, Poland is a buffer state. Poland's name comes from a word meaning plain. It is bounded on the east by Russia and on the west by Germany, but there are no highland barriers in these directions. Highland barriers are also lacking on the north. Only along the southern boundary, where the Carpathian Mountains separate Poland from Czechoslovakia, is there an effective physical barrier. Thus Poland is easily invaded by powerful neighboring countries. It constitutes a major battleground of Europe. Polish history shows that its boundaries changed from time to time.

For more than 400 years Poland was one of the largest countries in Europe. Look at the map on the next page and notice the size of the country in 1772. Poland then stretched from the Baltic on the north nearly to the Black Sea in the south. In fact, its river valleys were long used as routes of transportation between the Baltic and the Black Seas. At that time Poland was, next to Russia, the most extensive country in Europe. But Poland's power dwindled under the selfish policy of nobles who exploited the masses. It then became easy prey for the more powerful neighboring countries. By three successive partitions in 1772, 1793, and 1795, Poland was completely wiped off the map. The eastern part was annexed to Russia, the southern part was taken by Austria, and the western area became a



Before 1772 Poland stretched from the Baltic Sea nearly to the Black Sea. Note the position of the present boundary

part of Prussia. New Poland has an area of 149,957 square miles and a population of 33,823,000.

After the World War, the new Poland regained approximately its old western boundary, but the new eastern limits fell far short of those of 1772. (See the map.) The port of Danzig, located at the mouth of the Vistula (Wisla) River became a free city under the care of the League of Nations. Since the Vistula and its tributaries drain a large part of Poland, control of the mouth of this river is important. Poland had been given certain privileges for the use of railways and docks in the Free City of Danzig, but it also felt the need of having its own port. It therefore built the modern port of Gdynia on the northern coast. This coastal area is sandy and quite barren. It is the northern end of a narrow strip of territory generally called the Polish Corridor.

Poland's location between Russia and Germany places it in an

unhappy position. Germany and Poland both desire to have control of the Free City of Danzig, a trade center that is peopled chiefly by Germans and belonged to Germany prior to the World War. That part of Germany known as East Prussia is cut off from the rest of the country by the Free City of Danzig and the Polish Corridor. The establishment of these new frontiers led to serious disputes with Germany at the close of the World War and may cause trouble in the future.

Commercial importance of Poland's location. Located in the midst of the great lowland plain of Europe, Poland occupies an excellent position for commercial contacts with foreign countries. Important east-west routes follow the plain, and connect industrial western Europe with the agricultural eastern part, also with Asia still farther to the east. It has long been an important crossroad of Europe. Railroad lines connecting western Europe with Moscow pass through Poland. From Moscow the traveler may journey to the Far East on the Trans-Siberian Railway. Moreover, north-south routes cross the east-west ones. Some of the earliest trade routes between the Baltic countries and the Black Sea Region passed through Poland. At the present time an important north-south route follows the valleys of the Vistula and the Dnieper (Dnepr) rivers.

The population. Because of location and past history, Poland contains a mixed population. On the east the Russians predominate, while in the western part of the country the Germans are most numerous. The extreme south is inhabited by the Ruthenians, who also comprise the larger part of the population in the neighboring area of eastern Czechoslovakia. But the largest population group of all are the Poles themselves, who, like the Russians, are Slavs.

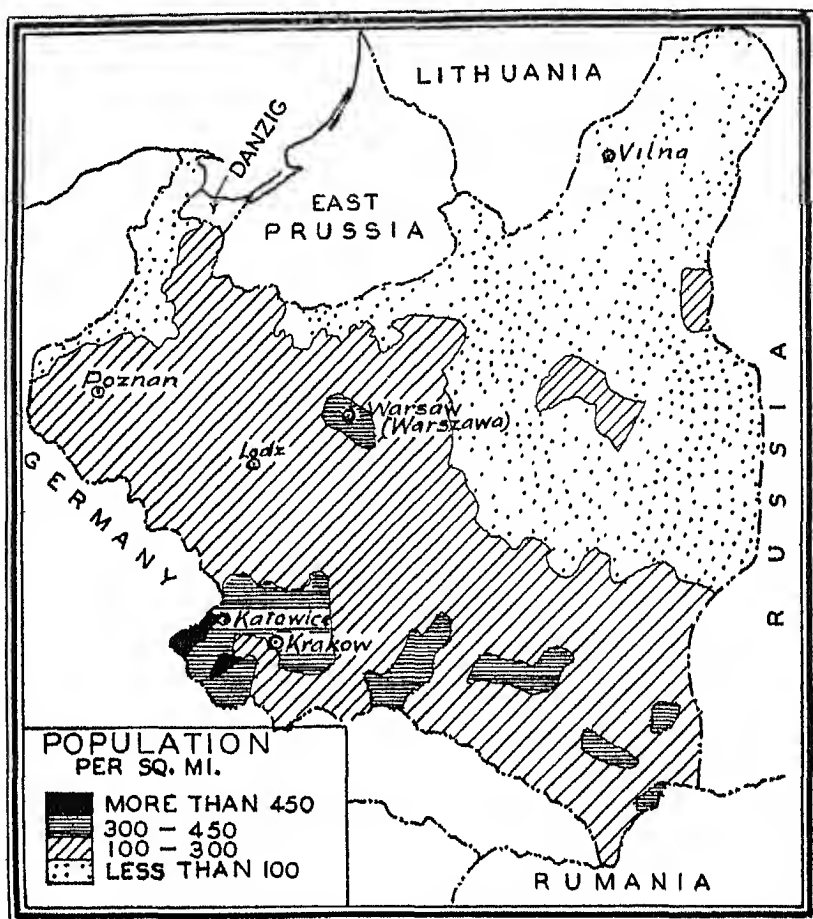
Contributions to civilization. Poland has given the world many great people—warriors, poets, musicians, and scientists. The great Polish warrior John Sobieski battled for Christianity against the Ottoman Turk at the walls of Vienna in 1683. He helped save western Europe from the many handicaps associated with Turkish rule. Kosciuszko, another of her great warriors, aided George Washington in the American Revolution. Poland has also given the world noteworthy scholars. To this race belong Madame Curie, the codiscoverer of radium, and Joseph Conrad, one of the foremost story-tellers. This race has given the world the noted composer

Chopin, the pianist-composer Paderewski, the noted actress Modjeska, and a host of other eminent persons.

Retarded development of the masses. Although Poland has produced many distinguished people, the great masses of her population have had but little opportunity to better their lot in life. In general, they are a hard-working people who have been handicapped because of oppression and foreign rule. Prior to the World War, when the inhabitants of a city in the Russian part of Poland rose in protest against oppression, the reply was often the brief but feared order: "Send the Cossacks!" These wild horsemen of Russia, armed with whips, clubs, and drawn sabers, would thereupon sweep through the streets of the city, beating the people to submission. Before the World War the population contained a small upper class who controlled the affairs of the nation and a large mass of poor peasants, most of whom were landless.

The peasants still make up the greater part of the population, but fortunately there are evidences of improvement in the economic life of these people. In ever increasing numbers they are acquiring their own land, as the larger estates of the landed gentry or nobles are being subdivided. Moreover, improvement in industry and trade has caused a gradual rise of a middle class.

Where most of the people live. According to the census of 1936, Poland contains 33,823,000 people and 149,000 square miles. Thus the population density is 225 per square mile, which is unusually large for an agricultural country. Look at the map on the next page and notice that the distribution is not uniform. Some parts, such as the southern and southwestern areas, contain more than 450 people per square mile, whereas eastern and northeastern Poland show densities of less than 150. In general, the densely populated areas possess advantages for economic development. The most highly industrialized regions are located in the south and west of Poland. These regions were formerly under German control and in many ways are the most progressive areas within Poland. They are also the most densely populated. On the other hand, much of eastern or Russian Poland consists of swamp and sandy soil. Here lie the Pinsk Marshes, which are located in the basin of the Pripyet River. The agriculture of this area suffers because of backward conditions and low crop yields. Accordingly, this eastern region is sparsely populated.



Distribution of population in Poland.

The importance of agriculture. Most of the inhabitants of Poland make a living by means of agriculture. They are engaged in producing crops as well as livestock products. Because of the great number of people who depend upon the soil for a livelihood, the crops and livestock products are consumed largely at home. Yet there is normally a small surplus of foodstuffs for export.

The chief crops are rye, potatoes, oats, wheat, and barley. Rye and potatoes are important crops in the Russian Plains of Germany on the west and in the Rye Belt of Russia on the east. Thus Poland is located in a natural setting in Europe in which these crops are

important Rye and potatoes thrive on sandy soils and in regions where the summers are cool to warm, rather than hot Here the soils have developed in glacial material, and like the soils of northern Germany, tend to be sandy in character The heavier and more fertile soils of Poland produce not only rye and potatoes, but also oats, wheat, sugar beets, and flax.

Poland supports an important livestock industry The chief types of livestock are hogs, cattle, and sheep. The livestock and livestock products are consumed largely at home

The major regions. Poland contains an extensive northern lowland, a plateau to the south of this lowland, and the Carpathian Mountains to the south of the plateau

Featureless plains make up the greater part of the northern lowland. Here much of the land is sandy, some of it is swampy, and all of it gives evidence of former glaciation The eastern part of the lowland contains the Pinsk Marshes On the other hand, the western or former German part contains the best farm land This region was favored with an advanced agriculture As in the neighboring country of Germany, there has been a good application of science to agriculture. Fertilizers are therefore widely used and the sandy soils of the area are made to yield large returns.

Along its southern margin the northern lowland gives way to a plateau Although the plateau is noted chiefly for its minerals and manufactures, it contains excellent farming land in the valleys This crop land is devoted chiefly to potatoes, rye, oats, and wheat Some sugar beets are also grown here, especially in the eastern part of the plateau.

To the south of the plateau, Poland contains a mountainous area It is a part of the Carpathian Mountains, which continue farther southward through Czechoslovakia and into Rumania As the smallest of the regions of Poland, this mountainous area contains relatively little crop land Here pastoral pursuits are important. The animals are frequently kept in migratory flocks, summering in the mountains and wintering in the valleys.

Manufacturing. Although Poland is largely an agricultural nation, manufacturing is well developed in some parts, especially in the southwest This area contains the most active and progressive group of people It was German territory prior to the World War and was developed largely with the aid of German training and capital.

Poland contains a considerable variety of natural resources for her industries. She possesses forests, power resources, and a number of metals. Her most valuable forests are located in the sandy districts of the north and in the Carpathian Mountains of the south. Most of her coal is obtained from the southwest, where the greatest industrial progress has been made. Poland mines coal in amounts sufficient to satisfy local or domestic requirements, and there is a surplus for the export trade. The country also contains other minerals, especially iron, zinc, lead, and petroleum. These are found largely in the highlands of the south. Among European countries Poland normally ranks second in the production of zinc and third (following Russia and Rumania) in the output of petroleum. But she must import iron ore to supplement her local production of that mineral.

Foreign commerce. In spite of a rather favorable combination of natural resources, Poland's industries are unable to satisfy the country's requirements. Thus, manufactured goods are imported in large quantities and during normal years make up nearly half of the total imports. On the other hand, exports consist chiefly of industrial raw materials and foods. Poland trades largely with Germany, the United Kingdom, the United States, Austria, Czechoslovakia, and France. She imports more from the United States than she exports to that country. The most important item of import from the United States is raw cotton.

RUMANIA

Increase in size after World War. Largely as a result of the World War Rumania more than doubled her size and population. During the World War Rumania disappointed the Germans by siding with the Allies. Since the Allies were victorious over the Central Powers (Germany and Austria-Hungary), Rumania got her reward by receiving bits of adjacent land. The former Hungarian territory of Transylvania was added in the west, the former Russian area of Bessarabia increased her size northeastward, and a bit of former Austrian territory was added in the north. Thus Rumania now contains 113,887 square miles of land and a population of more than 18,000,000.

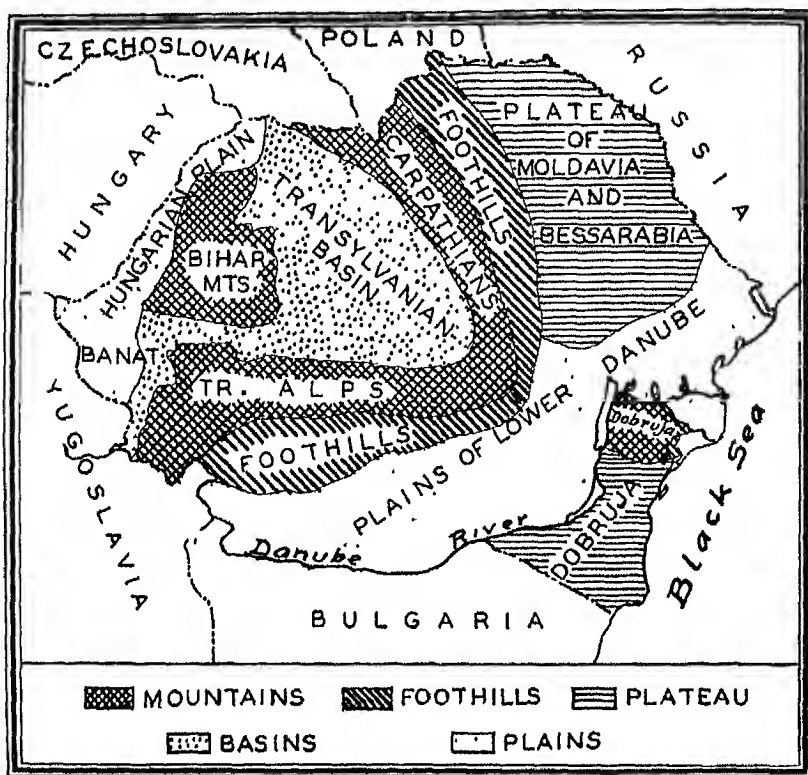
Agriculture, the major occupation. Nearly four-fifths of the inhabitants of Rumania are peasants. As in most parts of eastern

Europe, most of the peasants have long been handicapped because of poor education. Until recently many of them worked on large estates. But after the World War the greater number of the remaining large estates were subdivided into small bits of land. Thus at the present time the Rumanian peasants till small farms. In general, the farming methods are primitive. Slow-moving oxen and buffaloes are the chief draft animals, and reaping of grain is still performed with the aid of sickle and scythe in most parts of the country. But the Rumanian Government is trying to aid the peasants by selling them modern farm implements at low cost, and efforts are being made to obtain high-grade seed.

The chief crops. The two outstanding crops of Rumania are corn and wheat. Thus the cropping system reminds us of the southern part of Russia, which is similar in climate and soils. It also reminds us of the southern part of the Corn Belt of the United States, where corn and winter wheat are the leading cereals. All of these regions—Rumania, southern Russia, and the Corn Belt—have fertile soils and contain much level and gently rolling land. All three of these regions have a humid continental climate, with hot moist summers and cold winters. But the American Corn Belt has a more dependable rainfall. In amount of rainfall Rumania is somewhat comparable to the drier western part of the Corn Belt.

Wheat has long been grown in this part of Europe, but corn was introduced from America, the area in which this cereal originated. Corn is consumed in large quantities by the peasants, although there are also large exports. Wheat was the important crop of the large estates during the prewar period. It was also the leading agricultural export. Since the breakup of the large estates the corn acreage has increased, while the area given to wheat has tended to decrease. Wheat and corn are the leading agricultural exports of the country.

Besides wheat and corn, Rumanian peasants grow barley, oats, rye, potatoes, grapes, plums, tobacco, and hay. They also raise livestock, the most important being sheep, cattle, and hogs, but the livestock industry has not received the attention that it deserves, and there is considerable room for improvement. Most of the livestock and livestock products are consumed at home, little attention being given to exports. Cattle are raised mainly for work rather than for meat and milk, and in this respect differ from most of the cattle of western Europe. They are raised chiefly in the plains and mountain foothills and in some districts are driven into the mountain



Major natural regions of Rumania. Note the central location of the great mountain curve—Moldavian, Carpathians, and Transylvanian Alps. On the inner side of the curve one finds the Transylvanian Basin, on the outer side, the Foothill Region, noted for its petroleum fields. (Adapted from E. M. Sanders and the *Geographical Review*.)

pastures during summer. The highland regions contain large flocks of sheep. These animals are raised largely for their milk and secondarily for their wool and meat.

The major regions. Agriculture in Rumania varies from place to place because of the great variation in land surface. The central part of the country contains a long mountain curve. (See the map.) The Carpathians comprise the northern part of this highland and extend southward to the central part of the country. The Transylvanians comprise the southern part of the curve. To the east and south of the mountains stretch the plains of the Danube River, the mouth of which is located in eastern Rumania. Within the moun-

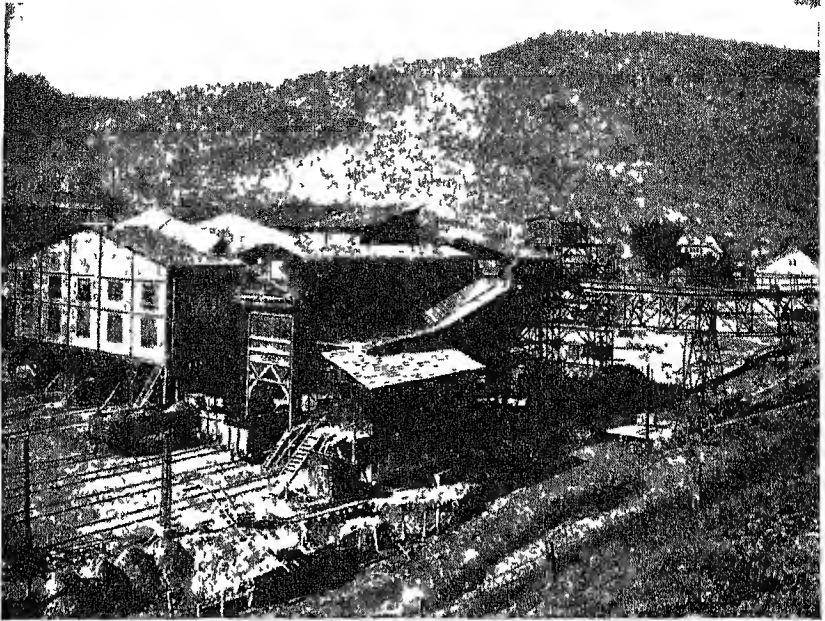
tain arc is the Transylvanian Plateau. In the extreme west, Rumania contains the Transylvanian Plain, which is similar to the Hungarian Plain, and belonged to Hungary before the World War. In the northeast Rumania possesses the former Russian province of Bessarabia, which is largely a low plateau. Another low plateau is located in the southeastern part of the country.

The central Rumanian highlands contain excellent stands of beech and oak on their lower slopes and evergreens in the upper parts. But beyond the upper timber line are extensive pastures, since the highlands receive the greatest amount of rainfall in all of Rumania. The highland pastures attract the herders from the valleys during the summer time. Thus a seasonal migration of livestock takes place here. Only a small proportion of the mountains is devoted to crops. Tiny agricultural villages nestle in the lower valleys. Here the peasants raise corn, potatoes, rye, wheat, and oats. Vineyards are found on the lower south-facing slopes. The highland farmer has but little contact with the outside world. He lives mainly unto himself, and contributes very little to the export trade of the country.

In contrast to the highlands, the Rumanian plains contain relatively little forested land. In most of these plains the greater part of the land is under cultivation. Corn and wheat, the leading agricultural exports of Rumania, are the chief crops of the plains. The farmers of the plains have a surplus of grain and contribute to the foreign commerce of the country.

The low plateaus of the northeast and southeast are largely cultivated lands, forests being nearly absent. In the low plateau of Bessarabia in the northeast more than two-thirds of the land is under cultivation, forests cover less than one-sixteenth of the total area, while most of the remainder is pasture land. This region is much like the adjacent land in the Ukraine of southwest Russia. It contains fertile, black soils. But the region receives a low and uncertain rainfall, and the peasants frequently suffer because of crop failure. The southern part of the area receives less than 11 inches of rainfall a year, and the northern part about 24 inches. The southeast low plateau (south of the Danube Delta) also suffers because of drought, and there are extensive areas of pasture and waste land. The moister districts are devoted to wheat, corn, and barley, while the dry areas are used for grazing purposes.

Mining. Rumania contains valuable mineral resources. Most of these are located in her central highlands, which are shown in the



A coking plant in the Transylvanian Highlands. The foothills located to the east of these mountains contain large deposits of petroleum. (Courtesy Royal Legation of Rumania.)

map on page 528. In Europe she is surpassed only by Russia as a producer of petroleum and is one of the leading exporters of that mineral. Most of the petroleum is mined in the foothill region located just to the east of the long mountain curve of the country. Within the highland curve, that is, in the Transylvania Basin, are extensive reserves of natural gas. The country also contains a number of other minerals, such as coal, gold, iron, copper, silver, lead, zinc, and salt. On the basis of her varied mineral resources there is considerable room for further development of industries, but capital is lacking.

Manufacturing. That Rumania is not an industrial nation is clearly illustrated by the fact that less than eight per cent of the working population is engaged in manufacturing. Less than eight per cent of the total water power has been developed, and most of the mineral resources await further development. Rumanian manufactures are more important at present, however, than they were before the World War. The former Hungarian province of Transylvania is the most highly industrialized part of the country. For the country as a

whole, the food industries, textile manufactures, and mineral industries are most important. Further development in Rumanian industry depends largely upon improvement in education, introduction of more modern industrial methods, and securing capital.

World commerce. Rumania's total and per capita trade are among the lowest in Europe. Yet the country produces certain foodstuffs and raw materials that are in great demand in the commercial world. The chief exports are grains and petroleum products, whereas the major imports consist of cotton yarns and thread, iron and steel, textiles, and machinery.

Most of Rumania's trade is with other European countries. Yet there is also some trade with the United States. In general the value of imports from the United States greatly exceeds the value of exports to our country. The leading imports from the United States are machinery, raw cotton, iron and steel, and automobiles.

Future of eastern Europe. The people of this large European region are concerned mainly with the production of raw materials. The extractive industries rather than manufacturing employ the greater number of workers. Manufacturing is making rapid progress in a number of districts at present, and will continue to develop so long as political stability can be maintained. Foreign capital will not move into areas which lack stability, and where those who invest the money might suffer great losses.

Two of these countries—Poland and Rumania—are in a dangerous and rather unhappy position. Poland is situated between two nations (Russia and Germany) which have waged war on Polish territory in the past, and it is not at all impossible that they may do so again. Rumania's location adjacent to Russia and Hungary is also considered unfavorable, since the latter countries lost territory to Rumania after the World War. Brooding over lost territory sometimes leads to war.

Although there is much land in eastern Europe there are also many people. Even if the land were divided equally among the people, there would be but little land for each individual. Moreover, large areas suffer because of backward conditions. As modern methods and modern machinery are introduced the people are able to produce larger crops. They will therefore have more with which to buy manufactured goods at home as well as abroad. In addition, modern manufacturing has made remarkable progress in some parts of the region. Ever increasing numbers of workers are being at-

tracted to the industries and the cities, and larger quantities of raw materials are being consumed within the region

QUESTIONS AND EXERCISES

- 1 What are the distinguishing characteristics of eastern Europe?
- 2 Russia is the world's largest nation. Only the British Empire surpasses her in size, but the British Empire consists of many nations. What are some advantages associated with large size?
- 3 Although Russia is a vast agricultural country in which most of the people are engaged in farming, poor conditions are still found over wide areas. Explain.
- 4 Name the crop belts of European Russia. In which of these belts would you expect to find the smallest percentage of crop land? Why?
- 5 How important is Russia in the production of fiber flax and wheat? Where and under what environmental conditions are these crops grown?
- 6 How extensive are Russia's forests? What are the predominant types of trees of these forests? Why have the forests been but little used?
- 7 Give a reasoned account of the Donetz industrial area of Russia.
- 8 What is the political and commercial importance of Poland's location?
- 9 Of what importance is agriculture in Poland? What are the chief crops?
- 10 What crops are important in Rumania but not in Poland? Why?
- 11 Of the major occupations, how important is manufacturing in Rumania? What types of manufacturing have been developed? What conditions are necessary before any appreciable further development of industry can be realized?

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Part IV

LEADING COUNTRIES OF THE
ORIENT

JAPAN—MAJOR PROBLEMS AND THE AGRICULTURAL INDUSTRY

Importance in the commercial world. During the brief span of less than 90 years Japan has developed from a little-known, secluded country to the foremost power in eastern Asia and one of the seven Great Powers of the world. Since 1854, when Japan opened her doors to world trade, her population has more than doubled. This rapid increase in population has been matched by a remarkable expansion in industry and commerce. She has become the world's leading source of raw silk, and one of the major producers of cotton textiles. In fact, by 1934 Japan imported more American cotton than did any foreign nation, and she competes with Great Britain in the sale of cotton textiles. In short, Japan has become the leading industrial nation in the Far East.

Critical problems confronting the Japanese. Many major problems have been associated with the country's rapid growth. (1) A serious problem has developed because of the abnormal increase in population density. (2) The rapid growth in industry has made necessary access to raw materials and an assurance that such materials will be available. Japanese expansion in the Far East has been due in large part to her desire to obtain control over industrial raw materials. (3) The rapid development of industry has caused an increasing drain on the agricultural lands. Moreover, large numbers of people have moved from the agricultural areas to the cities. (4) Many of the farmers have lost their land to wealthy industrialists and the wealthy landlord class, and to an ever increasing extent the farms are being worked by tenants. (5) Although agriculture is still the chief occupation in point of number of workers, it is surpassed by manufacturing and commerce as a source of national income. Approximately 50 per cent of the people are dependent upon agriculture as a means of livelihood, yet they account for less than 18 per cent of the nation's income. On the other hand, they make up the basic group of people in carrying the burdens of the nation. (6) Finally, the extremely rapid growth of commerce has created still other problems. Japan has reached out into distant lands in order to

dispose of her surplus merchandise. This desire to obtain markets has been clearly reflected in her recent political difficulties in the Far East. For example, in the year 1931 a Chinese boycott of Japanese goods in the Shanghai area led to warfare.

Her progress is of special importance to the United States, which is at present the greatest market for Japanese goods. Japan, in turn, is one of the best customers of the United States. We purchase more commodities (in value) from Japan than from any other Asiatic country. She constitutes a major market for our cotton and the leading source of our raw silk.

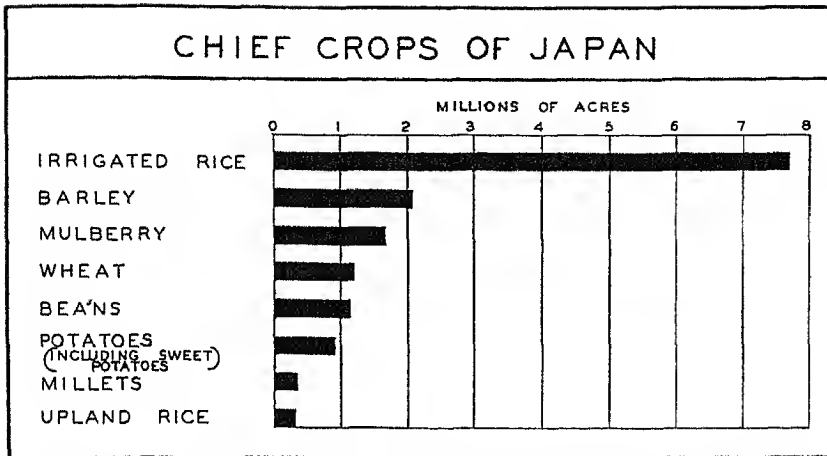
These chapters are intended to give an understanding of the major problems of Japan, the factors favoring and those retarding her progress, the chief occupations of the country, and her relations with other nations, especially the United States.

THE AGRICULTURAL INDUSTRY

Importance of agriculture. From the very earliest records of Japan we find that agriculture was the chief source of wealth and the most important occupation. In spite of the rapid strides that have been made in manufacturing and commerce, agriculture is still the major pursuit of the Japanese masses. Approximately 48 per cent of the people are directly dependent upon that occupation. But as a source of material income at the present time, agriculture is surpassed by manufacturing and commerce.

It is in the agricultural districts that one gets a true glimpse of Japan and an understanding of the Japanese people, since her large cities show the influence of western culture. Throughout the agricultural areas may be found one of the most intelligent peasantries in Asia. The Japanese peasants have been described as a patient, persevering, and hard-working people, whose simple life and temperate habits enable them to make a living on small pieces of land, and, in many districts, even under adverse conditions of soil and relief.

The agricultural districts contribute to the national welfare and progress of the country in various ways. From these areas the Japanese army draws large numbers of its finest fighting men. In these districts Japan is capable of producing most of the foodstuffs consumed by her large population, although there is a great population pressure on the land and resources, as we shall see later in

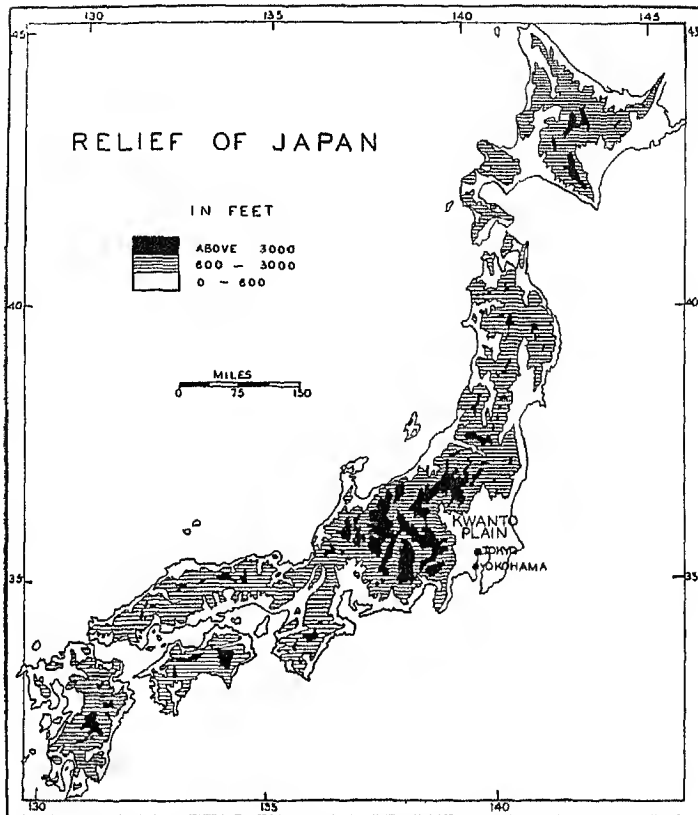


The acreage of the major crops of Japan. Note the importance of irrigated rice.

this chapter. The agricultural lands yield a sufficient amount of rice to make the Japanese third in the world in the production of that commodity. They raise enough mulberry and cocoons to maintain the world's leading commercial silk production. Japan also grows tea for export. But most of Japan's agricultural lands are used for the production of crops that are to be consumed at home. For example, nearly all of her rice, a crop that occupies approximately 50 per cent of the land, is consumed at home. In addition, barley, wheat, millet, beans, peas, and many different kinds of vegetables and fruits are grown, mainly for the home market.

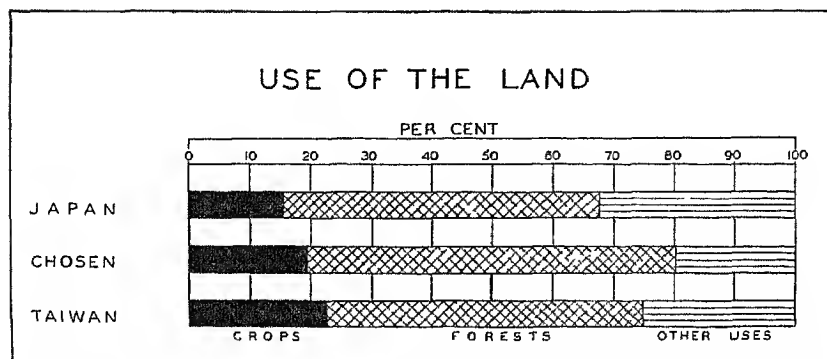
Chief characteristics of Japanese agriculture. Japanese agriculture shows many distinctive features or characteristics, among which the following are noteworthy: (1) A small proportion of the total area is devoted to crops. (2) The farms are small. (3) Primitive implements and hand labor tend to predominate. (4) Intensive methods of cultivation are followed. (5) Crop yields per acre are high, while the per capita yields are comparatively low. (6) Rice is the outstanding and distinctive crop. (7) Agriculture is of the subsistence rather than the commercial type. (8) Livestock are relatively unimportant in the greater part of the country. (9) There has been a relatively rapid increase of tenancy.

Small percentage of cultivated land. With rugged highlands covering the greater part of the country, Japan's agriculture is



The relief of Japan. Note the predominance of highland. Volcanic highlands cover large areas of land in the Japanese Islands

seriously handicapped because of unfavorable relief, as the map shows. Lowlands are narrowly limited in extent, being confined chiefly to the coastal areas. Moreover, many districts have rather poor soils, which have been made to yield large crops because of very careful tillage and extensive fertilization—a system of agriculture that is suggestive of gardening rather than general farming. There are, however, some naturally fertile alluvial lands that are devoted chiefly to rice culture. Under these conditions of relief and soil, we find that Japan has a comparatively small percentage of cultivated land. Recent census returns show that only 15.6 per cent of her total land area is devoted to crops and that less than one-fifth of her area is considered to be suitable for cultivation.



The use of Japan's land Less than 16 per cent of the total is devoted to crops.

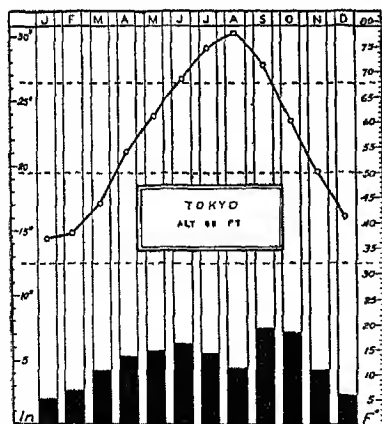
Consequently, one of the present major problems of Japan is that of finding additional areas of cultivable land for her rapidly increasing population. Since most of the nonagricultural lands are located in the highlands of the country, these areas are given considerable attention with respect to future expansion. Much of the so-called "wild land" is scattered through the highland districts. The government has granted special aid to those farmers who are willing to clear areas of "wild land" in blocks of about 12¼ acres each. But the area under cultivation can be increased only at great labor and expense, since the best lands have already been taken.

A country of small farms One of the striking features of Japanese agriculture is the tillage of small holdings. The average agricultural holding comprises only 2.7 acres. Just think of it! About as much land as is needed to feed a cow or a horse in the North American Corn Belt supports a family in Japan! Moreover, these miniature Japanese farms are frequently further subdivided into a number of small irregular patches of land that are separated by means of foot paths. One of the problems confronting the Japanese is that of combining these small units into compact areas of land. In fact, the Japanese Government has offered special concessions to those farmers who can turn the unproductive footpaths and boundary ridges into crop land.

Hand labor and primitive implements Although the Japanese have made great progress in adapting modern methods in the manufacturing industry, agriculture still remains much as it was during

feudal times Hand labor is the rule Modern labor-saving agricultural machinery is generally lacking. Essentially all of the work is done by hand, hoe, and spade, helped out at times by work animals, such as the ox or the horse But large types of livestock are scarce in the rural districts of Japan, since the farmers cannot afford to feed them Thus with their primitive equipment and hand labor, the Japanese are unable to care for large units of crop land The more fertile areas were selected first, then as population increased the poorer districts were added to the cultivated land Moreover, the small scale of farming and the large supply of cheap labor help explain the fact that labor-saving machinery is but little used

Intensive and painstaking methods Although primitive equipment is the rule in Japanese agriculture, the land is made to yield large returns because of the careful tillage, large-scale fertilization, and abundant irrigation, where additional water is needed The minute and careful system of agriculture is carried on with a thoroughness that suggests gardening. There is a liberal use of many kinds of fertilizers Little goes to waste. What would constitute sewage and waste material in most parts of the United States is applied to the land in Japan The maintenance of soil fertility is a serious problem in this densely populated country, in which the livestock industry is relatively



Average monthly distribution of temperature and rainfall in Tokyo, Japan. The entire southern part of Japan has a warm climate and an abundant rainfall, comparable to that of Tokyo

unimportant, and therefore comparatively little animal manure is available Moreover, the long frost-free period and the abundant, well-distributed rainfall cause considerable loss of mineral plant foods as well as erosion of soils (Graph at left) In addition to the various kinds of waste materials from the households, fertilizers are obtained from ground fish bone, green manure, sulphate of ammonia, blast furnace slag, and bean cakes The bean cake, which constitutes the compressed residue after the oil has been extracted from the soybeans, is the



Plowing for rice in a lowland district of Japan. Note the type of plow that is used. Oxen are sometimes used instead of human power to plow the rice paddies. (Courtesy U. S. Bureau of Foreign and Domestic Commerce)

most important of the commercial fertilizers. Bean cakes are imported from Manchukuo. In order that the loss may be reduced to a minimum, fertilizers are commonly applied to individual plants.

Yields per acre. Under the intensive, painstaking methods of agriculture, the farm lands of Japan are made to yield large returns per unit area. For example, the rice yields are higher than those of any major producer of that commodity. The yields of rice per acre are more than twice as large as those of the Philippines, an island area that lies much closer to the Equator. Yet the yields per capita are quite low, because of the tremendous population densities. For the country as a whole, there are approximately 2,900 people to each square mile of crop land. In short, there are so many mouths to feed that there is relatively little food for each individual, in spite of the large yields per acre. That Japan is almost able to feed herself under such conditions is an important and surprising fact.

The rice crop. Only China and India surpass Japan in the production of rice. Thus Japan is one of the three leading producers of this commodity in the world. The cultivation of rice also occupies the most prominent place in the use of the land within Japan. Such importance of rice grows out of two sets of facts: (1) the



Planting rice in Japan. Much labor is required each year in setting out the rice plants. This work of transplanting the rice from nursery beds to the flooded fields is done by hand. The planting of rice therefore calls for a great number of workers. In fact, the whole family works in the field. Such methods contrast sharply with those of our Texas rice district. (Courtesy Japan Tourist Bureau)



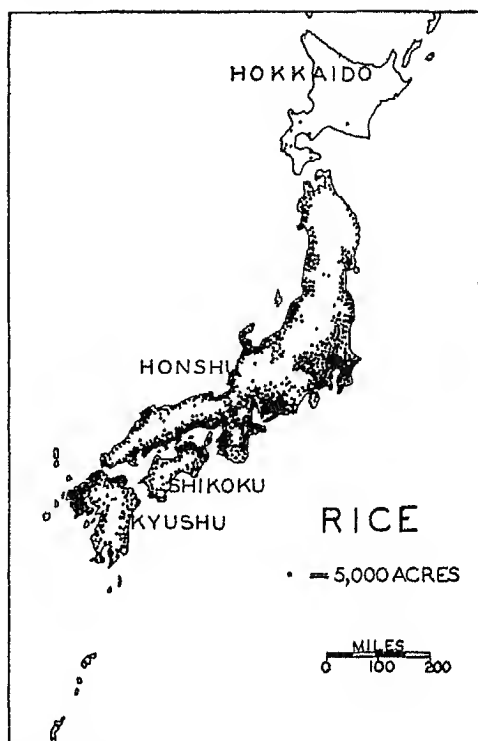
A Japanese rural scene in the rice harvest season. One of the periods of greatest anxiety comes during September, when the rice is harvested. The dread typhoon is then a constant threat, while birds and countless insects bring added worries. (Courtesy Japan Tourist Bureau)

abundant yields due to favorable environmental conditions, and (2) the great demand for rice, which assumes a singularly distinctive place in the Japanese diet

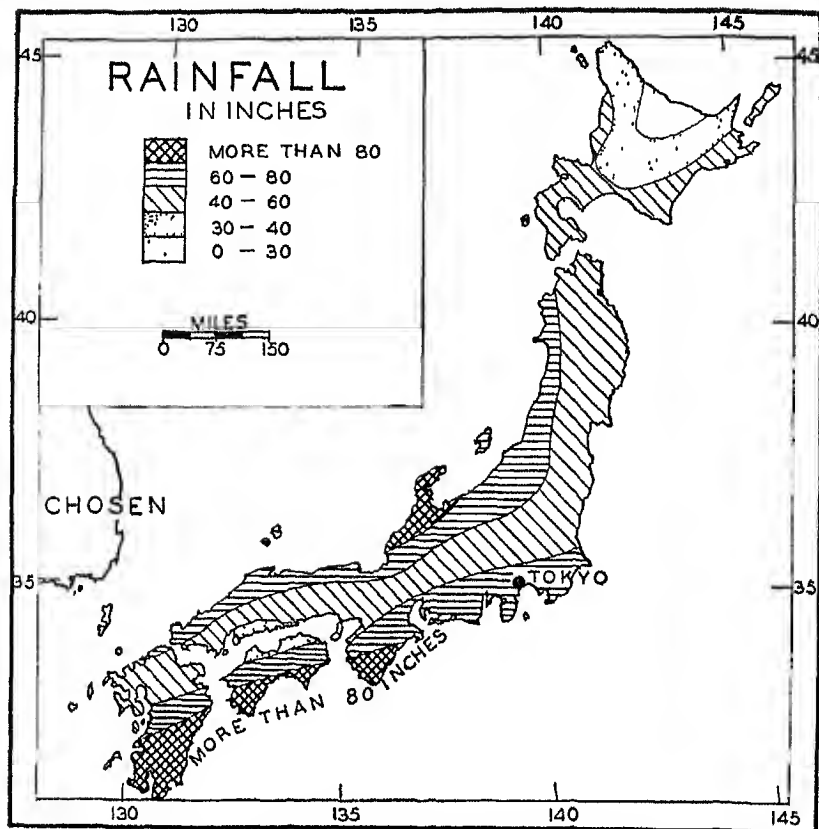
Of the 4,000 varieties of rice that have been found in Japan, the leading ones are grown in the lowlands. The hot, wet coastal lowlands of southern Japan have the most favorable climate for rice culture. Rice is relatively less important in the northern districts. The lowland varieties of rice are known as *paddy*, and contrast with the *upland rice* of Japan. Lowland rice is sown first in nursery beds, from which it is transplanted in June to the well-worked paddy fields. In general, irrigating

water is not applied to the land until the crop has been transplanted. Following the harvest in October and November, large areas of paddy (lowland rice) land are sown to winter crops, such as barley, wheat, and rye. It is one way—by means of intensive cultivation and almost complete use of the land—that Japan has become relatively independent of foreign food resources.

Mainly subsistence agriculture. By far the greater part of the agricultural output of Japan is consumed at home by the teeming millions. The rice, barley, peas, beans, millet, and vegetables—all are grown mainly for the domestic market. In spite of efforts of western powers to introduce new foods for the average Asiatic table, rice and vegetables still form the staple diet of the Japanese.



Dot distribution map of Japan's rice crop. Note the concentration of rice culture in the coastal lowlands. The interior highlands grow upland rice.

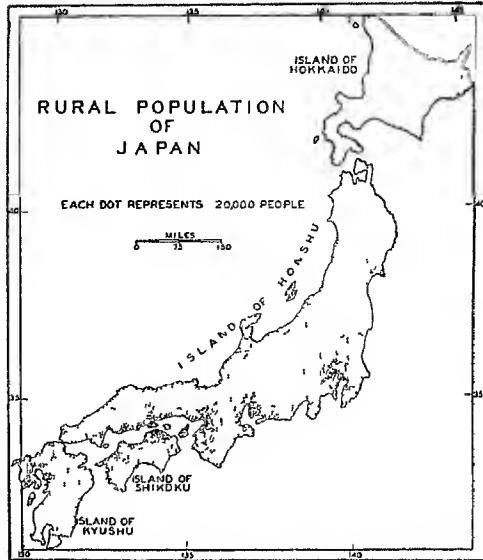


Average annual rainfall in Japan. If you look carefully at the above map, you will discover that, in general, the rainfall increases as you move toward the coastal margins of the Japanese Islands. Compare this map with the rice map of Japan.

masses. In the coastal districts fish and fish products are consumed in large quantities, and together with rice and vegetables make it possible to support very densely populated communities. Peas and beans are other important foods. Like fish, they occupy an important place among the food products of Japan, since they contain protein, and are used instead of meat.

Tea and the mulberry. Of all the agricultural products, tea and the mulberry are commercially the most important in Japan. Although the mulberry leaves do not constitute an item of export, they are used as food for the silkworms, and are therefore basic

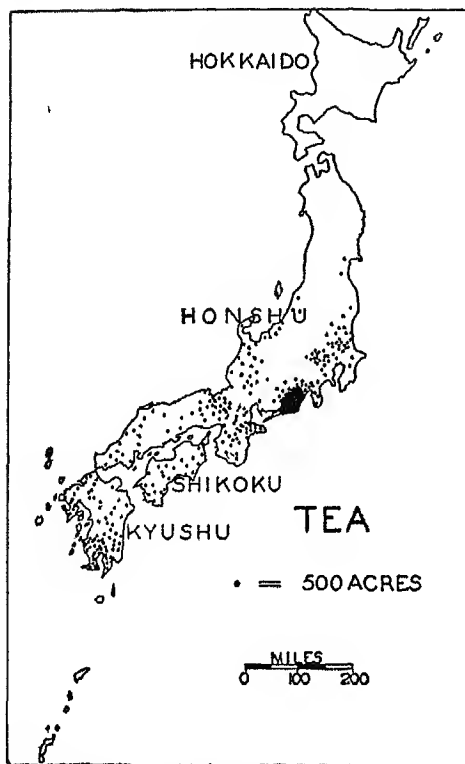
to the great raw silk trade of the country (See photo below) The mulberry is grown in many districts—in the highlands as well as the lowlands Unlike lowland rice, mulberry does not require irrigation Moreover, it is relatively more profitable than rice on soils that are thin, stony, or acid The most concentrated acreage of the mulberry occurs in the central part of Honshu, the largest of the Japanese islands In the extreme southern parts of Japan the winter climate appears to be too warm and humid for the storing of cocoons On the other hand, the northern part of the islands is handicapped by extremely cold winters and short summers Consequently, only one crop of mulberry leaves can be gathered in many of the northern districts, whereas several gatherings are made possible in Central Honshu Like the mulberry, tea is widely distributed in Japan and also shows districts of further concentration (Map, p 546) As the universal drink of the Japanese, it occupies an important



Dot distribution map of the farm population of Japan proper



Farm life in Japan. Picking mulberry leaves for feeding silkworms. (Courtesy Japan Tourist Bureau.)



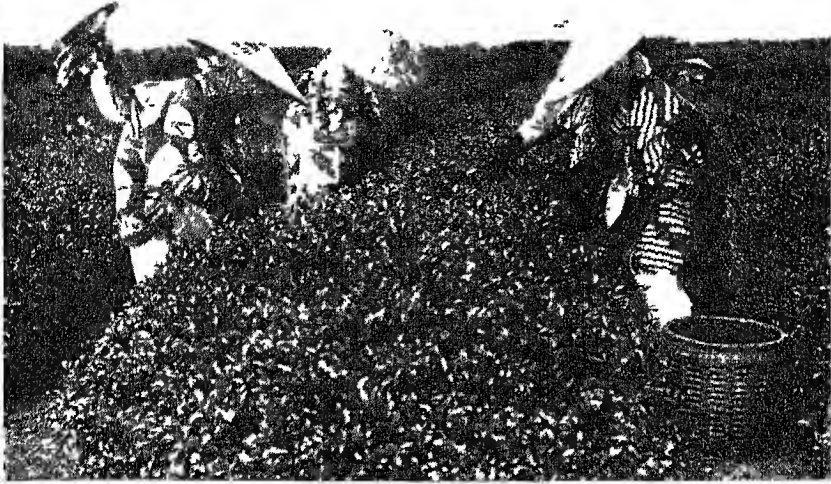
Most of Japan's tea is grown in the humid subtropical southern parts of the country.

place in the system of agriculture. But it covers only a small part of the cultivated land—only about .8 of 1 per cent. Moreover, most of this tea land is located in humid subtropical Japan to the south of latitude 37° . The best developed tea gardens are found on the highland slopes and terraces west of Yokohama. Three and four pickings of tea are made each year. (Photo opposite) Approximately two-thirds of the entire Japanese tea crop is consumed at home, whereas most of the remainder is sent to the United States as green tea.

Livestock relatively unimportant The livestock industry is poorly developed, in spite of the extensive areas of rugged high-

land that are generally unfit for crops. There are approximately 1,770,000 head of cattle, which means an average of only 25 cattle for every 1,000 people. Moreover, less than 80,000 of these cattle are classified as milk cows. About two-fifths of these milk cows are found in the cooler northern island of Hokkaido, where climate and better pastures have favored the dairying industry. Hogs are only half as numerous as cattle, and sheep are even less numerous. In fact, there are only 90,000 sheep in Japan. Because of the small number of livestock, the country has but little pork, beef, mutton, milk, butter, cheese, and wool. There is also a lack of hides for the making of leather.

According to the Japanese, such general lack of livestock is due to a number of causes. (1) Many of the highland districts of the



Picking tea leaves in Japan—a country noted for its green tea (Courtesy Japan Tourist Bureau)

country are owned by capitalists who charge fees that are considered too high under existing conditions in Japanese agriculture. The development of extensive highland pastures would necessitate low rents and low land values. (2) There is but little demand for livestock and livestock products, since the Japanese have never acquired strong wants and desires for the consumption of meat and dairy products. (3) Where human labor is cheap, the question of animal power is of little importance, as compared with many other parts of the commercial world. (4) It has been shown that a 1,000-bushel grain crop contains five times as much food value as the meat or milk produced from it. Thus, in this densely populated country, the production of crops for direct human consumption becomes a necessity. (5) There is a lack of good pastures, especially in the humid subtropical part of Japan.

The growth of tenancy At the present time the farmers of Japan are dissatisfied, burdened as they are by heavy taxes and competition with much larger agricultural holdings in other parts of the world. The high tax on the dwarf Japanese holdings has caused a rapid rise in tenancy. Moreover, increasing industrialization has



Repairing fish nets in a Japanese fishing village Japan surpasses all other nations in the value of fish products Mt Fujiyama may be seen in the distance (Courtesy Japan Tourist Bureau)

attracted people to cities. Great numbers of Japanese farmers have dropped from the ranks of landowners, and at the present time more than one-half of the rice land is worked by tenants. This trend toward tenancy seems to suggest the situation of Great Britain during the last half of the nineteenth century, when her agricultural population felt the brunt of competition with other agricultural lands, and her factories were attracting increasing numbers of the rural population. Today Great Britain has a larger percentage of tenant farmers than has any other great power.

Many of the farmers are also fishermen. In the coastal districts of Japan large numbers of the agricultural population have made fishing a part-time occupation. In fact, of the 1,500,000 Japanese engaged in fishing nearly one-half are also employed in other occupations, the most important of which is agriculture.

The importance of the Japanese fisheries is commonly overlooked. No other nation, not even Great Britain or the United States, has as large a catch of fish each year as has Japan. Approximately 361,000 fishing vessels are used in this great industry. Only 12 per cent of these vessels are equipped with motors.

Such importance of the fisheries is due to a number of factors. With its island location, long coastline, and shallow offshore waters, Japan possesses natural advantages for the widespread

development of the fisheries. Thus the entire coastline from north to south has witnessed the growth of the fishing industry. Moreover, ocean currents—the cold Okhotsk current from the north and the Kuro Siwo from the south—have added to the variety of marine life by providing different environments for various kinds of fish. Ocean currents also carry microscopic organisms upon which the fish feed. In addition, the dense population and small percentage of cultivated land help to explain why the coastal population has turned in large numbers to the sea in search of foodstuffs. Fish products add some variety to a diet which otherwise would consist almost entirely of rice and vegetables. Such products also made possible the early development of densely populated districts in the coastal lowlands of Japan. There were abundant yields of rice in these lowlands and great schools of fish in the off-shore waters.

At the present time fish products satisfy the domestic market and there is a surplus available for export. Herring, mackerel, sardines, tunny, and other low-priced fish, are consumed mainly by the natives. But the higher-priced products, such as crabs, salmon, and lobsters, are sent in large quantities to foreign countries. Approximately nine-tenths of the crabs and two-thirds of the salmon find a market abroad. Even the United States imports canned fish products from Japan.

Problems pertaining to foodstuffs. The problem of feeding an ever increasing population has caused considerable worry in Japan. But we have seen that Japan, by means of intensive cultivation of crops and heavy consumption of fish products, has managed to maintain a remarkable degree of self-sufficiency in foodstuffs. It is true that she imports fairly large quantities of rice from time to time. But recently the Japanese Empire has been quite self-sufficient even in this commodity. Thus in recent years the foodstuff exports have just about equalled the imports of such products. The future, however, will probably cause a change in this phase of her trade. With increasing industrialization people are moving to the cities. At the same time, ancient methods of agriculture still prevail, whereas modern equipment is utilized to an ever increasing extent in the urban centers of Japan. Moreover, if the Japanese population begins to demand a greater variety of foodstuffs, larger quantities of such products will be imported from foreign countries.

QUESTIONS AND EXERCISES

1. If you were to visit Japan, what are the things that you would like most to see?
2. What are the major problems that have been created because of Japan's rapid growth?
3. In what ways do the agricultural districts of Japan contribute to the country's welfare and progress?
4. What is the percentage of crop land in Japan? Why is it low?
5. In what ways are the Japanese attempting to add to the cultivated acreage of their country?
6. Why are comparatively few large work animals found in Japan? How is most of the farm work performed?
7. Explain the large yields per acre in Japan. Why are there low yields per capita in that country?
8. Where are the most important rice and tea districts of Japan located? Before giving your answer, study the distribution maps of these commodities.
9. Explain the general lack of livestock in Japan.
10. What has caused a growth of tenancy in Japan with recent years?
11. What are the problems pertaining to the foodstuff situation of Japan?

FURTHER READINGS

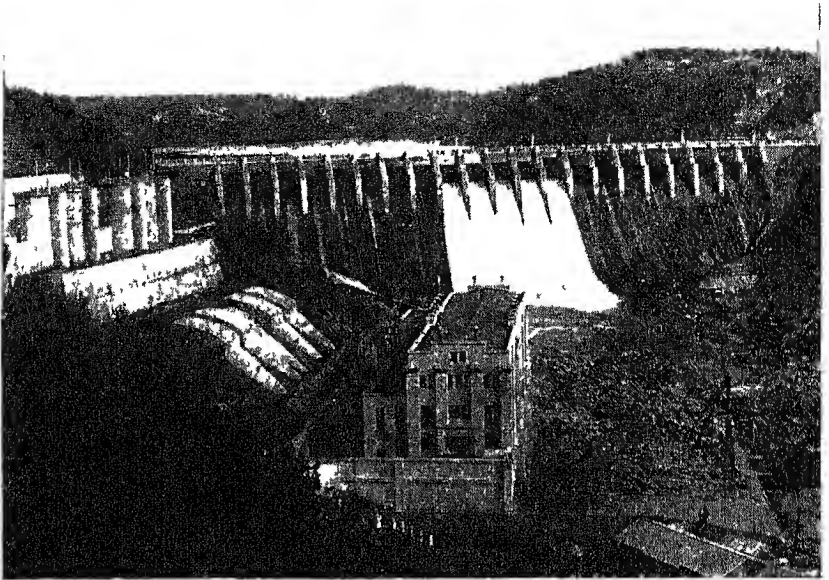
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JAPAN—MANUFACTURING, COMMERCE, AND COLONIES

Recent development of manufactures. As an industrial nation, Japan has made phenomenal progress during recent years. This is especially true of the country's cotton textile industry, in which Japan has become one of the leading commercial producers. She has been the chief commercial source of raw silk since the first decade of the present century, and is turning more and more to the manufacture of silk tissues (fabrics). She has added variety to her textile manufactures by developing rayon and woolen textile industries. Progress in Japan's commercial dyestuff industry is indicated by the fact that German manufacturers have become seriously concerned. Rapid progress has also been realized in the manufacture of commercial fertilizers, paper, canned foods, pottery, toys, optical instruments, and metal products. In the development of water power, Japan leads all Asiatic countries.

Causes of industrial progress. Various factors have made possible Japan's industrial progress. Of the conditions that have directly influenced the development of manufacturing in Japan, the following are noteworthy: (1) the favorable location with respect to oriental raw materials and markets; (2) the presence of moderate amounts of power in the form of coal and water power, (3) climatic conditions that make possible the production of various kinds of raw materials; (4) an abundance of cheap labor; and (5) government aid and protection.

There are, however, also certain handicaps and limitations which should not be overlooked. For example, Japan lacks many of the raw materials which are considered essential to a large modern industrial development. Her available iron ores would last the United States less than one year. Although she produces enough coal, sulphur, chromite, tungsten, mica, and nearly enough copper to satisfy local requirements, a number of other minerals must be imported in large quantities. Most of the lead, zinc, petroleum, potash, phosphates, and tin consumed in Japan must be imported from foreign countries. All of the antimony, nickel, bauxite, and



A modern water-power plant in Japan. In hydroelectric power development, Japan is the leading nation in the Orient. (Courtesy Japan Tourist Bureau)

mercury must be obtained from abroad. She depends upon foreign countries for all of the rubber and wool and nearly all of the raw cotton used in her industries.

The human factor in Japanese industry. One of the chief causes of Japan's rapid industrial progress is the human factor. The energy and industry of the people, their willingness to co-operate for the general welfare and progress of their country, and the simplicity of the Japanese mode of living, all have played a part in the development of her industries.

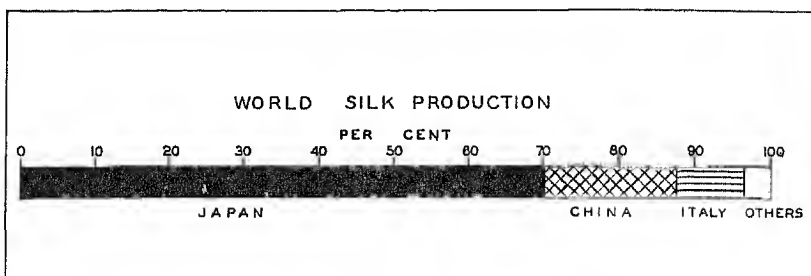
Wages and standard of living. Many of the people in the Occident, and especially those who are seeking protection against low-priced Japanese goods, say that the producing costs in Japan are low simply because the people live very poorly, and that they are persecuted and exploited by capitalists. Wages, it is true, are lower than those in the industrial countries of the West, but they are low because of the great oversupply of workers who are willing to be satisfied with the bare necessities of life. The Japanese manner

of living is simple and inexpensive. Westerners say it is their low standard of life which makes such low wages possible. Yet many of the items of material culture which people of the Occident enjoy would not appeal to the Japanese masses. The Japanese are well satisfied with their simple diet of rice, starchy vegetables, and fish, in contrast to the more expensive meat and potato diet in the West. They prefer to sleep on the floor rather than on innerspring mattresses.

Women workers in Japan receive wages of only 25 to 30 cents a day. Yet they are provided with low-cost, clean living quarters or dormitories. It costs them little more than five cents a day for food. This low cost for food is made possible because of the fact that the gas, water, and utensils used in preparing and serving the food are provided by the companies for which they work. Moreover, the food is simple and inexpensive. It consists chiefly of rice, with side dishes of vegetables and fish.

The raw silk industry. In the production of silk, Japan occupies a distinctive place in the commercial world (Illus., p. 554). With a production of more than 90,000,000 pounds of silk a year, Japan is the foremost silk-exporting nation of the world, accounting for nearly three-fourths of the commercial supply of raw silk, most of which in normal times is consumed by the United States. This silk trade is of vital importance to the agricultural as well as the manufacturing classes of Japan, since the production of silk really starts with the raising of silkworms in the rural districts. In fact, to the farmers of Japan, sericulture (silk culture) is surpassed in value only by the rice crop of the country. To the manufacturing industry, raw silk has been the chief commercial commodity—the leading export until 1934, when it was surpassed in value by cotton cloth.

Factors that have favored sericulture. A study of the raw silk production of the world indicates that the leading sources of supply are Asiatic and European countries. This is so because, for best results, silk culture requires warm, uniform temperatures—lands that favor the production of the mulberry, the leaves of which are fed to the silkworms. Such climatic conditions are found in many parts of the world, even in southeastern United States. But the whole process of raw silk production calls for so much cheap labor that most countries have been unable to develop the industry. In Japan the silk industry is favored by the oversupply of workers,

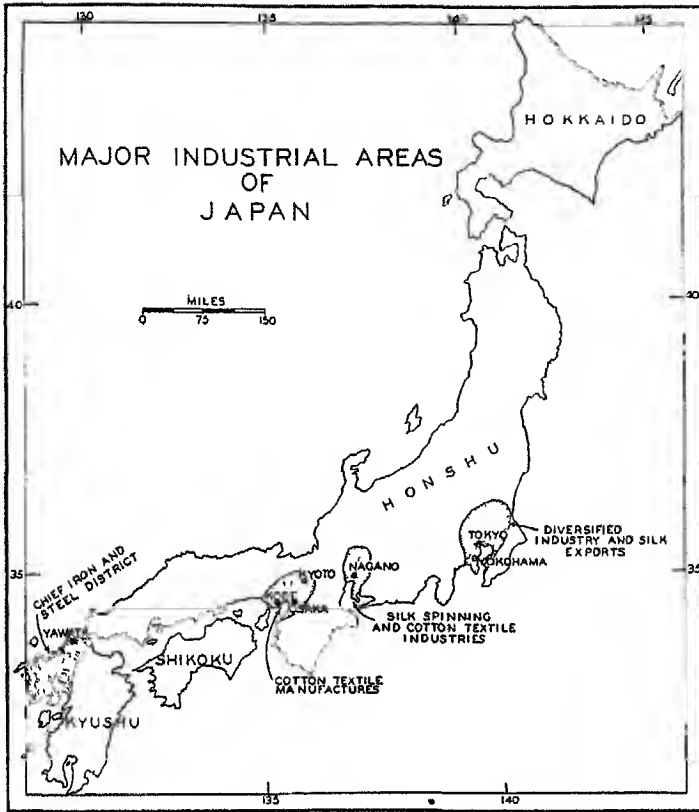


The leading commercial producers of raw silk

hence cheapness of labor. Moreover, the long experience or training in such production has given Japan a marked advantage over many other areas in the commercial world.

Although the silk industry is widely distributed in subtropical Japan, there are well-defined areas of concentration. The most favored districts appear to be the highland region of central Honshu, and the coastal lowlands which extend from Osaka to Tokyo and Yokohama (Map on p. 555.) Although Yokohama is the leading exporting port for Japan's raw silk and Nagoya is one of the leading silk spinning cities of the country, the highlands of central Honshu have attracted the more basic phases of the industry, such as the raising of cocoons and the reeling of raw silk. In fact more than one-fourth of Japan's silk reeling takes place in central Honshu, some distance inland from Tokyo and Yokohama. Such further concentration of the silk industry within Japan has been due to the relatively drier and cooler atmospheric conditions and the abundance of pure water found in the highlands. Since the reeling of silk from the cocoons is done to a large extent by means of steam filatures, large quantities of pure water are required.

Competitive position. During the early years of the present century China surpassed Japan as an exporter of raw silk. At the present time, however, Japan produces more than two-thirds of the silk of commerce. What factors have enabled Japan to surpass China in the commercial production of this commodity? In both countries the production of cocoons is a household industry, but it is on a more scientific basis in Japan than it is in China. In general, the Chinese farmer selects his own silkworm eggs, whereas in Japan the selection is left to the Government experts. Thus in



Chief industrial districts of Japan. Note that these districts are located in the southern part of Japan proper.

China one ounce of silkworm eggs produces only 15 to 25 pounds of cocoons, whereas in Japan the production is approximately five to six times as large. From one-half to three-fourths of the Chinese silkworms die before they are hatched because of weakness and diseases. Scientific selection of strong disease-free silkworm eggs would mean a greater production in that country. In Japan the reeling of the silk from the cocoons is done to a large extent by means of steam filatures, in contrast to the primitive home methods employed in most parts of China. Moreover, the Japanese industry has the advantage of better organization and training of labor as well as better marketing organizations. The government has come to the aid of the industry by constructing warehouses, so that the

silk might be stored during periods of surplus production. The commercial contacts of Japan with the rest of the world have been worked out with great care. The Japanese have succeeded in meeting the specific requirements of the leading consumers of her silk.

Critical problems of the Japanese silk industry. The price of raw silk has fallen during recent years so that it is only one-fifth as high today as it was in 1925. Of course, the drastic fall in the price of raw silk and the fall in demand by the United States, Japan's leading customer, account for the decline in raw silk exports during recent years. Moreover, the increasing competition of silk with rayon has also affected the industry. These conditions have caused a serious blow to Japanese agriculture as well as manufacturing, since the silk business really starts on the farms. But Japan has met the challenge of rayon by developing a rayon industry of her own, which compares favorably with that of leading European nations. It is, however, surpassed by the rayon industry of the United States. Moreover, Japan has developed an important silk-manufacturing industry and is therefore consuming increasing quantities of her raw silk for the making of silk tissues and wearing apparel.

The cotton textile industry. Of all Japan's manufacturing enterprises, the cotton textile industry has witnessed the most marked progress. Although Japan must import nearly all of the raw cotton used in this industry from the United States, India, and China, she has become the leading commercial producer of cotton textiles in Asia. India, it is true, surpasses Japan in number of cotton spindles. Yet India produces cotton cloth mainly for the domestic market rather than for world trade. In fact, India also imports large amounts of cotton cloth from foreign countries, and recently Japan has been a major source of such imported material. The Japanese trade in textiles has increased with remarkable rapidity during the last few years. Thus by 1933 Japan did what Germany and the United States had failed to do—she took over England's position as the world's leading exporter of cotton textiles. Since 1934 Japan consumed more United States cotton than did any other foreign country. It should be noted that cotton has long been Japan's chief item of import.

A number of factors have favored the development of the cotton textile industry in Japan. The large Oriental markets require large

quantities of cotton cloth, and Japan sells her cotton textiles mainly in eastern and southern Asia. On the basis of nearness to Oriental markets, Japan has a marked advantage over western Europe and the United States. An abundance of cheap labor has also aided the growth of the textile industry, although the labor factor plays a less important part today because of the increasing introduction of labor-saving machinery. Within recent years the Japanese have insisted on the purchase of the best and most modern textile machinery. Moreover, the Japanese have established excellent sales organizations in order to dispose of their products in foreign countries. In short, the low price of Japanese textiles is not due entirely to low wages and low standards of living, as many people tend to believe.

The manufacture of cotton textiles takes place chiefly in the region of Osaka and Kobe. (Illus., p. 555) Osaka has become the leading industrial city of Japan, chiefly because of the development of the cotton spinning and weaving industry. However, the commerce of Osaka is closely associated with that of Kobe, a city located only 20 miles away. Kobe has become the foremost port of Japan. The cotton textile industry has also developed in Nagoya and Tokyo.

Other textile industries. Although Japan depends entirely upon other countries for raw wool, the manufacture of woollens has been added to her textile industries. In fact, the average of the period 1935 to 1940 showed that wool ranked fifth among the various items of import, and that woven wool fabrics were listed among the ten leading exports of the country.

Japan also depends upon foreign countries for most of the materials which enter the manufacture of rayon. Yet she has developed a rayon industry which compares favorably with that of leading European producers, and during the period 1935 to 1940 rayon cloth ranked third among the exports of Japan. Most of the pulpwood used in rayon manufacture comes from the forests of Hokkaido and the highlands of eastern Manchukuo.

The iron and steel industries. The production of iron and steel is often taken as an index of industrial strength. In this industry Japan is the leading producer of the Orient, in spite of the fact that she is poorly endowed with coking coal and iron ore. Her iron ore reserves would last the United States less than one year. It is therefore necessary to supplement the local production of iron

ore with imported ore, pig iron, and scrap iron. Iron ore is obtained from Chosen, China, and the Straits Settlements, pig iron from Manchukuo, whereas large quantities of scrap metal are imported from the United States. These materials are obtained at comparatively low prices. On the other hand, coking coal is relatively high in price. Japan is nearly self-sufficient in coal; that is, under existing conditions but little coal must be imported. But most of the Japanese coal is unsatisfactory for the making of coke. Moreover, the coal seams are often folded and broken, and in many places contain gas pockets. Mining is therefore difficult and expensive. The best of the domestic coking coal is obtained on the island of Kyushu.

Although Japan imports large quantities of raw materials for the manufacture of pig iron, she has become relatively self-sufficient in the manufacture of steel. Ten years ago Japan was dependent upon other nations for 50 per cent of the steel consumed within the country. At the present time the domestic output of steel nearly equals consumption. This industry has been greatly aided by the development of electric power. It has also received a vast amount of government aid and protection.

Japan's leading iron and steel district. The city of Yawata, located in the northern part of Kyushu Island, is sometimes called the "Gary of Japan." It is the leading iron and steel manufacturing city of Nippon. Various factors have favored development. Iron ore and pig iron come to Yawata by means of cheap ocean transportation. The general area of northern Kyushu—the district in which Yawata is located—produces most of the high-grade coal that is mined in Japan. Thus northern Kyushu accounts for more than three-fourths of the pig iron and one-half of all the steel manufactured in Japan.

Other modern industries. In addition to her textile and iron and steel manufactures, Japan has made noteworthy progress in a number of other industries. Her paper industry has been developed rapidly, so that Japan now produces sufficient amounts of certain kinds of paper to satisfy domestic requirements. Progress in the dyestuff industry is indicated by the fact that German manufacturers have been making strenuous efforts to reach some kind of foreign sales agreement with the Japanese. Her fertilizer industry is rapidly being placed on a commercial basis. If development continues, Japan will become an exporter of fertilizers. Other note-

worthy upward trends have been experienced in the manufacture of toys, soaps, machinery, optical instruments, and pottery.

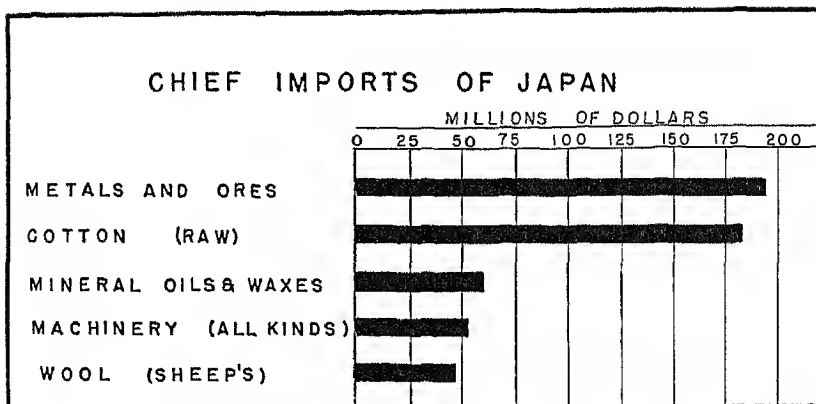
Cottage and workshop industries. To Japan's modern manufacturing enterprises must be added the cottage and workshop industries. Many of the articles that are marked "Made in Japan" have been produced in the homes and in small workshops. These home industries are scattered throughout the rural villages as well as the large urban centers. Tokyo, Yokohama, Nagoya, Kobe, and Osaka boast of modern factories, yet in thousands of homes small articles are also being prepared for foreign markets.

J A P A N ' S F O R E I G N T R A D E

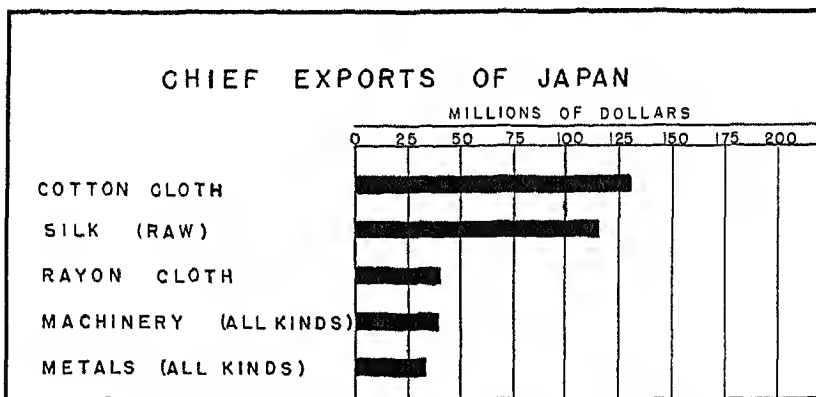
Development. In the field of foreign trade Japan has shown an amazing skill and rapidity of development. She has become the leading commercial nation in eastern Asia. Her import trade has grown from less than \$17,000,000 in 1870 to more than \$1,000,000,000 sixty years later. This growth in the country's foreign trade has followed the improvement of transportation and communication, the introduction of modern factory enterprises, specialization in the production of raw silk, and the development of foreign trade organizations.

Merchandise exports and imports. A study of the merchandise trade indicates that Japan, like Great Britain, is dependent upon the outside world for raw materials. Especially important are unmanufactured cotton, raw wool, metals, and mineral oils. (Illus., p. 560.) Like those of Great Britain, her exports consist chiefly of manufactures and semimanufactures. In general, raw materials constitute approximately three-fifths of the total of all imported goods; whereas manufactures and semimanufactures make up more than four-fifths of all exports.

Trade with the United States. In normal times most of Japan's foreign trade is conducted with the United States, China, and India. Of these the United States is most important, being the leading market for the exports and the chief source of the imports. The two countries are therefore complementary markets, that is, each has something that the other lacks. This is especially true with regard to the leading items of the Japanese-American trade. Japan supplies the United States with raw silk; whereas, the United States provides Japan with unmanufactured cotton. In addition, we send



The leading imports of Japan during the period 1935-40



The leading exports of Japan during the period 1935-40.

wood, iron and steel, machinery and parts, mineral oils, and automobiles to Japan in exchange not only for raw silk but also many other items, such as pottery, tea, and toys.

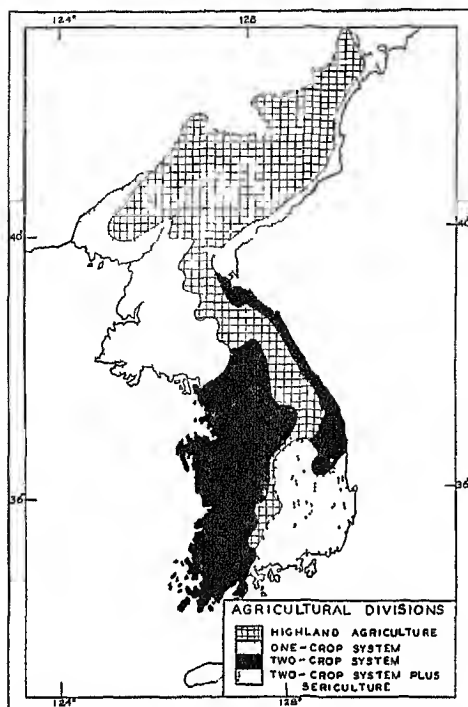
Within recent years there has been considerable anxiety within the United States concerning the commercial expansion of the Japanese textile industries. The textile manufacturers of New England have complained about the difficulties under which they are laboring, demanding that the Federal Government take action against the imports of cotton textiles from Japan. Both the United States and Great Britain have felt the Japanese competition in the textile export trade. Japanese goods are being sold in ever increas-

ing quantities in the world's largest textile markets, such as China, British India, the Netherlands Indies, and the Near East (south-western Asia) In these areas price is the main issue owing to the limited purchasing power of the natives In such areas the Japanese goods also compete with the products of all other leading textile-manufacturing nations

POSSESSIONS OF JAPAN

Need for colonies. With a yearly population increase of approximately 750,000 people, Japan is seeking means of livelihood for her teeming millions Great numbers of people have gone into industry, and further industrialization will attract other millions in the course of time But Japan is poorly endowed with many of the industrial raw materials She must, therefore, import such commodities. This lack of essential raw materials at home has prompted her to acquire adjacent areas with the hope of obtaining some of the raw materials as well as markets for her manufactures In addition, the Japanese have moved into other parts of the world They are, however, not allowed to settle in some countries, such as the United States and Canada But they have moved into various of their possessions, of which Chosen, Taiwan, and southern Sakhalin are the most important Others have settled in Manchukuo, the partly independent country of eastern Asia The Japanese, however, have not shown any great desire to leave the homeland and settle in foreign areas They cling to the traditions and customs of Old Japan Moreover, most of the Japanese who live in Chosen, Taiwan, and Manchukuo are engaged in occupations other than agriculture. As agricultural colonists the Japanese would not feel satisfied to work along with the Korean farmers of Chosen, whom they consider as inferior Similarly, the Japanese feel that their standard of living is much higher than that of the Chinese, who make up more than 90 per cent of the population of Manchukuo

Chosen. Chosen is the name given to the former kingdom of Korea, which was annexed by Japan in 1910. With its 85,228 square miles of land and more than 21,000,000 people, Chosen already has a moderately dense population—approximately 250 people to the square mile. Yet the population density is considerably lower than that of Japan proper (437), and in contrast to



The major geographical divisions of Chosen

Japan a much smaller proportion of the total population of Chosen is engaged in industry and commerce. Approximately 85 per cent of the Koreans are dependent upon agriculture; whereas 48 per cent of the Japanese are engaged in that occupation.

Nearly 20 per cent of the total area of Chosen is classified as crop land, and 60 per cent is in forests. Since much of the country consists of rugged highlands the crop land probably will never exceed 25 per cent of the total area. The best agricultural lands are located in the western and southern coastal lowlands, and these areas are also very densely

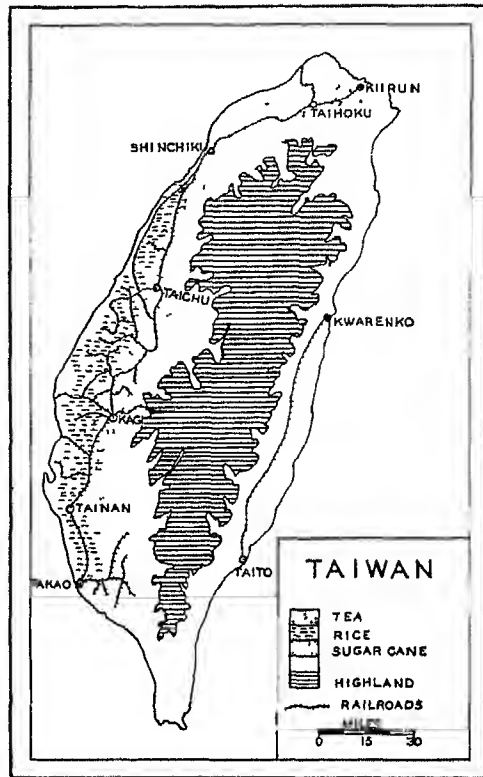
populated. Because of the humid subtropical climate, large areas of Chosen produce winter as well as summer crops (See the map). Only the northern regions have a one-crop system, that is, only one crop is harvested each year. Approximately one-third of the crop land is devoted to rice, with secondary crops of barley, wheat, beans, cotton, tobacco, mulberry, fruits, and vegetables. Rice is the chief money crop and the leading export of the country. Most of it is sent to Japan. The chief mulberry region is located in southeastern Chosen, where the greatest part of the country's silk is produced. The greater part of Chosen's cotton is grown in the western lowlands as a summer crop, although rice occupies the greater acreage even in that region. After the rice harvest much of the land is devoted to winter crops, of which wheat and barley are the most important.

Industry and commerce are but poorly developed, and the trade is mainly with the mother country. Japan takes more than 90

per cent of all the exports, the chief items being rice, soybeans, and silk. Chosen also sends fertilizers, pig iron, and cotton to Japan. On the other hand, more than three-fourths of all the imports are obtained from Japan. A vigorous foreign trade would not be expected, since the people of Chosen have a low productive capacity and a low purchasing power. Most of the people are poorly educated, unprogressive, and resent Japanese rule.

Taiwan (Formosa) and Karafuto (Sakhalin). Within the Japanese Empire the islands of Taiwan and Karafuto occupy extreme locations. Taiwan, located astride the Tropic of Cancer, is surrounded by tropical seas, whereas Karafuto is bathed by the cold waters of the north. Only the southern part of Karafuto belongs to Japan, the northern half being Russian territory.

The island of Taiwan, taken from China in 1895, is largely forest-covered and consists mainly of highlands. The forests contain some valuable types of trees, including the camphor tree, and Taiwan has become the world's major source of camphor. Yet agriculture is the chief occupation of Taiwan's 4,600,000 people, most of whom live in the western lowlands. Here the cultivated lands are devoted largely to rice, tea, and sugar cane. (Illus. above.) Rice is the chief food crop, and in some districts two crops are obtained from the same land each year. In contrast to the rice, which is grown chiefly in the level lowlands, most of the tea is raised in



Major production areas of leading crops, the chief railways, and larger cities

the hills and slope lands of northern Taiwan. Here the well-known oolong tea constitutes one of the leading exports. But cane sugar has surpassed tea as an item of export. Like Cuba, a tropical island of North America, this tropical island of Asia has developed a thriving sugar industry. Taiwan produces approximately 800,000 tons of cane sugar a year. Much of this sugar is sent to Japan proper. In fact, Taiwan's production of this commodity has made it possible for the Japanese Empire to become practically independent of foreign sources of sugar.

Karafuto, unlike the tropical island of Taiwan, is located to the north of Japan proper, in the same latitude as Newfoundland (50° N). Like the island of Newfoundland, Karafuto contains large stands of coniferous timber. Like Newfoundland also, Karafuto is handicapped because of the short growing season and the long cold winters. Consequently there is but little crop land. Most of the 45,000 acres of cultivated land is devoted to hardy cereals, grasses, and quick-maturing vegetables. Fishing is the major occupation. The coniferous forests of Karafuto furnish some timber for the Japanese newsprint industry. Coal and petroleum are also obtained, although these metals are more plentiful in the northern or Russian half of the island.

Neither Taiwan nor Karafuto can offer more than a partial solution to the pressing population of Japan. Japanese colonists have settled in Taiwan, but the population density of this island now exceeds 330 per square mile, and most of the people are crowded into the western lowlands, where the rice and sugar cane are grown. Large quantities of these commodities are sent to Japan proper. Karafuto is much less attractive to the Japanese colonist. Its cold, northern climate makes rice culture impossible, and agriculture is poorly developed. But great numbers of Japanese fishermen make seasonal journeys to the offshore waters of Karafuto, where they catch herring, crab, and salmon.

Finally, it appears that Japan is using the colonial areas to an ever increasing extent as a source of foodstuffs and industrial raw materials and as a market for finished products. Japan's interests in North China and Manchukuo have followed a similar course. Larger markets and more abundant raw materials have strengthened Japan's industrial position in the commercial world. They have also made it possible for an increasing number of her people to engage in industry and commerce.

QUESTIONS AND EXERCISES

- 1 What are the factors that have favored Japan's industrial progress?
- 2 What are the conditions in Japan that have made it possible for the masses to work for comparatively low wages?
- 3 Explain the development and present importance of Japan's silk industry
- 4 Japan's silk industry is facing a critical situation Why?
- 5 Although Japan must import nearly all of the raw cotton used in this industry, she has become the leading commercial producer of cotton textiles in Asia Explain
- 6 Why has Yawata become the chief center of Japan's iron- and steel-manufacturing industry? Give reasons
- 7 Of what importance is Japan's foreign trade with the United States? What are the exports to our country? What are the imports from the United States?
- 8 In what ways are Japan's colonial possessions of value to her?
- 9 Of what value is Chosen to Japan?
- 10 Name the chief crops of Taiwan Where are these crops grown? Why is the crop land of Taiwan found mainly in the western part of that Island?
11. To what extent do Taiwan and Karafuto help solve Japan's pressing population problem?

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POPULATION AND MAJOR PROBLEMS

An ancient civilization. The civilization of the Chinese traces back four or five thousand years. Their religion, language, agricultural practices, literature, and art were developed and gradually took on a distinctive form in the densely populated river valleys. Leading scholars claim that the present Chinese civilization originated in the Wei Ho Valley, a major tributary of the Hwang Ho. This valley has therefore been called the "cradle of the Chinese civilization." From this area of origin the Chinese people spread outward throughout the Hwang Ho Valley, and into the river basins of the Yangtze and the Si

Isolation retards development. As pointed out in Chapter 21, European civilization also traces back to ancient beginnings. For example, some of the chief units of early European civilization were located in the Mediterranean Basin. But the civilization of Europe has witnessed revolutionary changes, while that of China still shows evidences of comparatively little change. Thus while the peoples of Europe have become highly industrialized, have devised large, modern, labor-saving machines, and have carried their civilization to every part of the globe, the Chinese still do most of their work with hand labor and simple primitive implements, very much as they did several thousand years ago. They still cling to superstitious beliefs and ancient customs, and tend to live in the past, as reflected by the deep reverence for their ancestors. On the other hand, Europeans have cast off superstitious beliefs and have become a forward-looking people.

Occidental culture has made its way into some of the larger cities and scattered coastal districts of China, while the Chinese masses have changed but little. However, during some periods of their history, they made major contributions, such as the invention of the mariner's compass, gunpowder, and movable block printing. During the third century B. C. they built the Great Wall of China, one of the greatest construction feats of all time. In the building of

this 2,000-mile wall the Chinese used 300,000,000 cubic yards of masonry, and it cost the lives of some 30,000,000 laborers, or one life for every ten cubic yards of masonry

One of the chief reasons for the maintenance of an old civilization in China is the fact that the country was long cut off from other peoples. Natural barriers and great distances prevented ready communication and transportation contacts with other civilizations. Vast stretches of highlands, deserts, and steppes separated them from the European civilization. To the north lay the cold lands of Siberia, to the south the humid tropical regions, and to the east the largest of all oceans. Contact with India and its Hindu civilization meant a journey by water of more than 3,000 miles. The western coast of North America is even more remote, and the small Chinese boats were not built to withstand long ocean voyages. Even if they had been able to cross the Pacific, our west coast would have had essentially nothing to contribute to the ancient Chinese.

Just as they have built walls around their cities and walls around their homes, so there are practically impenetrable walls of conservatism around each Chinaman. Change must come from the outside. But how can the ideas of the Western world quickly break down these walls of tradition and custom that have developed undisturbed throughout the ages?

Accordingly, both the country and the individual were isolated. But isolation results in retarded development. This fact is verified in many parts of the world. Even in the isolated valley areas of the southern Appalachian region, the high degree of isolation has resulted in backward conditions. We learn from others. In the United States and in parts of western Europe, with telephones, telegraph, and newspapers we learn each morning of the major events of the world during the night. Millions of Chinese seldom hear about the outside world during their entire lives. If a doctor living in Sweden, England, or other parts of the world discovers the remedy for a new disease, the American Medical Association hears about it almost immediately. On the other hand, it sometimes requires several weeks for the news of a severe earthquake or famine to trickle out of western China.

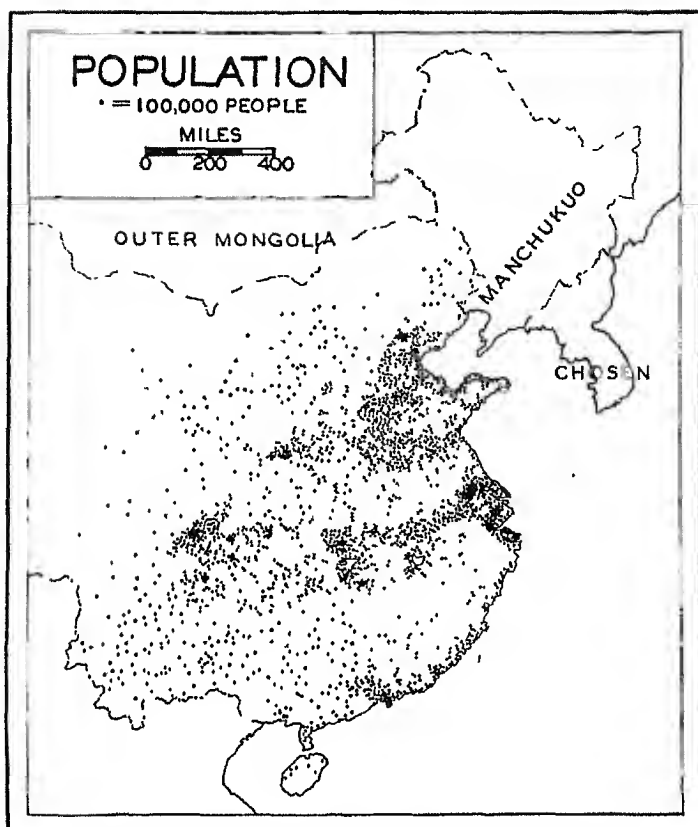
The world's largest population. China is not only the oldest of nations, but with respect to population it is also the largest. Russia has more land, but China has more people. The exact number of people living in China is not known, however, because the country

lacks an official census. Many estimates have been made, including figures from the scattered postal districts of the country, and most of these estimates place the total population between 450,000,000 and 500,000,000. China, therefore, contains nearly one-fourth of the entire population of the world.

The Chinese a poor people. Most of the people are concentrated in the fertile valleys and adjacent slope lands of southeastern China. Here overcrowding spells poverty, since there is great pressure of population on land and resources. The Chinese have not as yet developed a civilization that uses large amounts of natural resources other than the soil. In spite of intensive cultivation, only small amounts of food are produced per capita, since there is but little land per capita. The Chinese are not sufficiently advanced industrially to pay for food with manufactured products, nor do they have a sufficient agricultural surplus with which to buy substantial quantities of manufactured goods. In short, China's millions must be satisfied with the bare necessities of life. The consumption of elaborate manufactures such as machines, electrical instruments, and automobiles plays no part in the lives of the masses.

Distribution of population. Most of China's millions inhabit the humid southeastern river basins, such as the basins of the Hwang Ho, the Yangtze, and the Si rivers. This southeastern part of the country, generally known as China proper, contains approximately four-fifths of the entire Chinese population. (Map opposite.) As noted previously, the masses of Chinese possess little more than the bare necessities of life—food, clothing, and shelter. With the present standards of living the density of population of any part of China is therefore dependent upon the amount of food and clothing which can be produced within it. Shelter can be constructed from the earthen materials in any part of China. Since the river valleys contain the most fertile and productive soil to be found any place, it is not surprising that these areas are the ones most densely populated. In this respect the regions of densest population differ from those already studied in Europe and the United States. There, as we have already seen, the greatest density of population is found on the coal fields and near commercial centers, though the fertile soils also support dense populations.

The Chinese Republic also contains the outlying dependencies of Inner Mongolia, Tibet, and Chinese Turkestan or Sinkiang. They



Distribution of population in China—excluding Manchukuo. The most densely populated regions are the Hwang Ho Valley, the Lower Yangtze Valley, the Si Kiang Delta, and the Red Basin. All of these stand out nicely on the map. Each dot represents 100,000 people.

are sparsely populated areas, consisting chiefly of deserts, semi-arid regions, and highlands. Even Manchuria is still considered a part of China by the foreign powers, although it was seized in 1932 by the Japanese. Under Japanese direction Manchuria became a separate political unit known as Manchukuo. The Japanese have recently extended their control over large parts of North China and Mongolia.

A large consumer and producer. The large population makes it necessary for the Chinese to produce large quantities of economic goods, especially foodstuffs. Most of the people work hard and



Primitive method of threshing grain still used in China. This man beats the grain with this large broom, thereby separating it from the chaff. (Courtesy U S Bureau of Foreign and Domestic Commerce)

produce little more than is needed to satisfy the requirements of the home markets. The greater number are poor farmers who lack the machinery that is necessary for large-scale commercial agriculture. In fact, they are too poor to buy the necessary machinery for their small farms. Hand labor and primitive implements are the rule. China is therefore not a leading commercial nation, and the per capita trade of the country is decidedly low. Yet the extremely large

agricultural population—the largest of any country in the world—has caused China to become one of the leading nations in the production of some agricultural products.

China is the world's leading producer of kaoliang (a grain sorghum), sweet potatoes, millet, and vegetable oils. Although India surpasses her in the export of tea, China leads in the total output of that commodity, most of which is consumed at home. She rivals India as a leading producer of rice, and ranks next to Japan in the production of raw silk. Only the United States and India exceed China in cotton culture, and recent estimates place China second to the Soviet Union as a producer of wheat.

HANDICAPS TO MODERN ECONOMIC DEVELOPMENT

Handicaps numerous and deep-seated. China's economic development is adversely affected by many factors. Religion, tradition, superstitions, family relations, ignorance, famine, and shortage of certain vital raw materials all play a part in retarding Chinese economic activities. Some of these handicaps may be overcome. Others, such as the traditions and superstitions, go back thousands

of years. They are, therefore, deep-seated, and any change must of necessity be slow. Still other handicaps, such as droughts and floods, are part of the natural environment which man cannot alter.

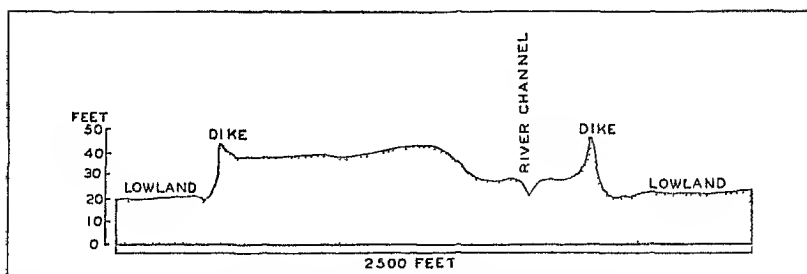
Religions, traditions, and superstitions. Through religion and traditions the Chinese tend to hold the agricultural industry in great esteem, at the expense of manufacturing, mining, and commerce. The people still cling to superstitious beliefs, although these are breaking down slowly because of contact with other people. Great importance is placed on the family rather than the individual as the working industrial unit. For example, when a man marries, he becomes the protected member of a certain family unit. He is taken care of somehow, although he may be a worthless individual.

Illiteracy and lack of capital. Illiteracy, though not so high as that of India, is estimated at approximately 75 per cent. At the present time various mass-education movements are being sponsored by the government as well as by private institutions. In addition, the lack of necessary capital is a serious obstacle to modern economic development, especially since the country is greatly in need of modern communication and transportation.

Climatic variability and food supply. One of the most serious problems of China is that of maintaining a sufficient food supply for the enormous population. Millions are always hungry and underfed, while in about four years out of ten, famine stalks the land. In order to prevent famine or to reduce the loss of life, China sometimes enacts laws prohibiting the export of certain foodstuffs during years of deficiency. A shortage of food is almost a constant fear in large sections of the country where the great masses of poor people find it almost impossible to lay much aside for the future. When droughts or floods cause crop failures, millions of people suffer, and there is often a great loss of life.

Droughts and famine. Droughts constitute one of the most common causes of famines in China. Rainfall is associated with the period of summer monsoons, when the air is moving from the adjacent oceans into the interior of China. But during some years the monsoons are weak, and bring but little rain. Moreover, these winds sometimes come late and are irregular after they finally set in. Thus the growing season may be interrupted by periods of dry weather.

The greatest variability in rainfall occurs in the drier sections of the country, such as in North China. The most serious famines



A cross section of the lower part of the Hwang Ho. Because of the constant deposition of silt in the lower part of this river, the channel has become higher than the adjacent lowland. Floods have, therefore, become a constant menace to human life in this region of irregular rainfall.

are witnessed in the densely populated regions in which there is normally just a sufficient amount of rainfall for crops, any slight deficiency causing crop failures.

Floods and famine. Widespread floods constitute another major cause of famines. The chief rivers of China originate in the adjacent highlands, where they pick up a large amount of sediment, some of which is deposited in the middle and lower courses of the rivers, thereby building up their channels. Thus throughout its lower course the level of the water in the Hwang Ho is above that of the surrounding lowland. We shall not attempt to explain the principle here, but merely state that the position of the river with respect to the flood plain is indicated by the cross section diagram above. The Hwang Ho has not only overflowed its banks repeatedly, but it has frequently changed its course by forming new channels over the plain. At times it causes enormous losses of life and is called "China's Sorrow." Similarly, death, destruction, and desolation have been associated with the large floods of the Yangtze River. During one serious flood period (1931), it was estimated that more than 30,000,000 people were driven from their homes. Think of it! One-fourth as many people as live in the United States were driven from their homes by one flood! When the flood waters finally receded many homes had been ruined, crops had been destroyed, livestock drowned, families had been separated and many lives lost. For months afterward the water was impure, and millions of undernourished people were burdened with anxiety, worry, and overwork trying to reclaim their homes. Such conditions favor the outbreak of pestilence and plague. Con-

sequently, the loss of life during periods of widespread flood is almost unbelievably large.

Lack of internal unity. Although China is large and densely populated, she is a comparatively weak nation. She has met with speedy defeat at the hands of foreign countries. One reason for this weakness lies in the lack of internal unity. For example, in 1936 and 1937 the Japanese forces extended their control over large sections of North China, where they have met with comparatively little resistance; whereas the South Chinese of the Canton area attempted to force the Nanking Government to fight the invader. In fact, throughout Chinese history this lack of internal harmony has often led to friction between North China and South China.

Need for better transportation. China is poorly equipped with modern transportation facilities. There are but 6,000 miles of railroad in the entire country (excluding Manchukuo). Goods are transported over poor roads and largely by human carriers. Organized bodies of coolie carriers have opposed improvements in transportation, fearing the competition and the conditions of unemployment which would follow. Formerly, superstitious fears of the people caused a retarded development of rail transportation, whereas at the present time the Chinese lack the necessary capital as well as credit for any extensive program of railway building. They could build more and better highways, however. They have an abundance of cheap labor, the most important factor in road-building. Some improvements have been made, and the country now has 40,000 miles of road suitable for automobiles.

Rivers, canals, footpaths, and wheelbarrow trails are still the chief routes used for travel and for transportation of goods from place to place. Machine and animal power play a minor role. Carts pulled by animals are used to a greater extent in North China than in the other regions. Human labor is still the chief power used in pushing, pulling, and carrying goods. Here the wheelbarrow takes the place of the truck and the freight car used in the United States. Springless carts, sedan chairs, and jinrikishas are poor substitutes for the automobile and air-conditioned railroad coaches used by Americans. Food converted into human energy is a poor substitute for the mechanical power supplied by gasoline, petroleum, and coal. Even on the canals the canal boats are pushed or pulled by human labor. Since coolies earn only 25 to 30 cents a day, many people believe that the cheap labor causes low transportation costs.

in China. But that is not the case. It often costs 25 cents to move a ton of goods one mile, or ten times the rate on railroads in the United States.

A better transportation system is greatly needed in order to weld the different parts of the country into one strong nation. As long as the Chinese depend chiefly upon wheelbarrow trails, hand-pushed vehicles, and hand labor, the country will remain, as at present, a collection of separate political units.

Shortage of fuel. There are large areas in North China where one cannot see a single tree in the landscape. The forests were cleared centuries ago and even the roots of the trees have been dug up for fuel. Stalks and roots of plants are used as fuel every year in this region of low winter temperatures. A poor crop means fuel shortage as well as food shortage. Yet these people live in a region that is favored by large deposits of high-grade coal. Some of the largest coal deposits in all of Asia are located in the western part of the Hwang Ho drainage basin. It is of significance to note that the per capita coal consumption of the United States is 100 times that of China. This large country of the Far East awaits the time when mechanical energy based on the widespread use of coal will displace some of the human energy which is expended so freely.

As long as most of the energy of the Chinese people is used in the drudgery of making a living, they will have but little energy left for the finer things of life. The Chinese farmers know nothing about the six- and eight-hour day demanded by American laborers. For the great masses of people the length of the working day is determined largely by human endurance.

Inability to stop banditry. The economic life of China has been adversely affected by the weakness of the government. The inability of the country to stop bandit raids has been due to the lack of unity of the people, poor roads, poor transportation facilities, and the expense and difficulties involved in moving armies into the bandit-ridden territories.

The prevalence of banditry in the Manchurian region was one of the chief reasons given by the Japanese for their intervention in that area in order to protect their large capital investments. Similarly, much of North China has been subjected to repeated raids by large organized groups of bandits.

THE AGRICULTURAL INDUSTRY

Chief characteristics. The chief features of the agricultural industry, the major occupation in China, are as follows: (1) a small percentage of cultivated land, (2) small holdings, (3) intensive crop production with rather primitive tools; (4) large yields per acre but small yields per capita; (5) multiple cropping and interculture, (6) emphasis placed on crops rather than livestock; (7) a widespread system of irrigation, and (8) regional differences in crop production based mainly on differences in climate.

The cultivated land and size of farms. Many people believe that nearly all of the land in China is under crops. That is not true. Even in the densely populated region of the southeast, known as China proper, less than one-fifth of the whole land area is under crops. For the entire Chinese Republic (including Inner Mongolia, Tibet, and Sinkiang) the cultivated land comprises less than one-tenth of the total area. This low proportion of land under crops is due mainly to rugged relief and unfavorable climate. In the outlying dependencies to the west of China proper the chief disadvantage is the arid climate. But in humid southeastern China (China proper) the rugged relief is the chief handicap to a more complete use of the land for crops. In the humid river plains nearly all of the land is under crops, but most of China proper is very hilly and mountainous.

The large population of China makes it necessary for the people to use all available land. They have made complete use of the lowlands, except in some areas where burial mounds are still to be found. In many districts the population also utilizes the hillsides. For China as a whole, the pressure of population on land is so great that each farm contains but few acres of land. The average size of the 60,000,000 agricultural households of China is approximately 3.5 acres, and there are thousands of farmers who make a living by cultivating an acre of land or slightly more. Under such conditions there can be but little land per capita, since the average Chinese family is large.

Intensive cultivation and large yields. With their primitive agricultural implements the Chinese farmers would be unable to work large tracts of land even though such land were readily

available to them. As shown in Chapter 3, it takes a man with a spade approximately two weeks to turn the soil of an acre of land. On that basis, it would take a Chinaman a whole year for the single operation of spading (the equivalent of plowing) a 26-acre farm. This would of course leave him no time for sowing, cultivating, and harvesting the crops. The Chinese, therefore, concentrate on the best land. In spite of the primitive methods, the close personal attention makes the small Chinese farms very productive. Nothing goes to waste. What constitutes sewage in America is quite generally applied to the land in China. By means of painstaking tillage and careful conservation of all fertilizers, the Chinese have maintained the fertility of their soils for many centuries. They are indeed the "Farmers of Forty Centuries."

Multiple cropping and interculture. In most parts of China, and especially in the south, two and more crops are produced on the same land in the course of a year. This system of making the land yield several crops a year is known as *multiple cropping*. The common practice of planting crops in rows lends itself readily to this system of multiple cropping. For example, in certain places in the Yangtze Delta, one may see wheat at maturity, beans two-thirds grown, and cotton just planted. This system of growing alternate rows of crops is known as *interculture*. It involves two distinct advantages to the well-being of the rural population: (1) the possibility of obtaining different crops from the same land, and (2) the maintenance of fertility, since the various crops do not draw equally on the mineral plant foods of the soil. For example, a crop of beans or peas would increase the nitrate content of the soil, while large amounts of nitrate are removed in the growth of a cotton crop, and much phosphate is removed in the production of grain.

Emphasis placed on crops rather than on livestock. The ability of the Chinese to make a living on small bits of land is due mainly to the fact that their diet is largely composed of grains and vegetables. They are vegetarians to a much higher degree than are the peoples of the United States and western Europe. They grow crops mainly for direct human consumption. In fact, beef cattle industries and dairying are of no importance, and for all practical purposes are nonexistent. Cattle are used chiefly as work animals and only secondarily as a source of meat. When consumed by the people directly, a crop of grain has a food value that is approximately five times as great as that of the meat and dairy products.

which can be produced from it. Moreover, the Chinese grow tremendous amounts of beans and other vegetables. Beans and peas, commonly known as *pulses*, are rich in nitrogenous substances, and therefore take the place of meat in the diet

The chief types of livestock in China consist of work animals, hogs, poultry, sheep, and goats. In general, work animals are lacking on the smaller farms. On the thousands of small holdings of one to two acres of cultivated land, a horse or an ox would consume the entire crop, and nothing would remain for the family. On farms of five to ten acres of crop land, one will commonly find work animals, but even there the tendency is to keep only one animal, such as a water buffalo, an ox, a horse, or a donkey. The water buffalo is found chiefly in South China, the horse in the north. Hogs and poultry are found in all parts of China. These animals pick a living on the scrap materials available on the farms. Sheep and goats are found in regions of waste or untilled lands. They are consequently more numerous than other types of livestock in the areas of rugged relief and in the arid and semiarid regions.

Irrigation widely practiced. Irrigation is practiced in all parts of China. In the dry northern and northwestern regions the land is irrigated in all districts where water is available for that purpose. In areas of low precipitation, where water is not sufficiently plentiful for irrigation, the Chinese grow quick-maturing, drought-resisting millets, and depend upon dry-farming methods. Even in the more humid southern, southeastern, and central areas of the country, irrigation is practiced in order to obtain the largest possible yield of rice, a crop that requires an abundance of water. In fact, irrigation is required chiefly for the paddy fields of China. In the valleys of the Yangtze and Si rivers, thousands of canals are used for irrigation. Even the silt that accumulates in them is applied to the land so that soil fertility may be maintained. In these areas various methods are used in lifting water from the canals to the paddy fields. One of the most general methods is an endless chain of wooden paddles that runs in a wooden trough. One end of the endless chain is placed in the canal, whereas the other end is elevated to the paddy fields. The chain is rotated in such a manner that the filled buckets are carried constantly upward from the irrigation canal to the fields. Scooping buckets and human tread arrangements are also used. In some areas pumps operated with



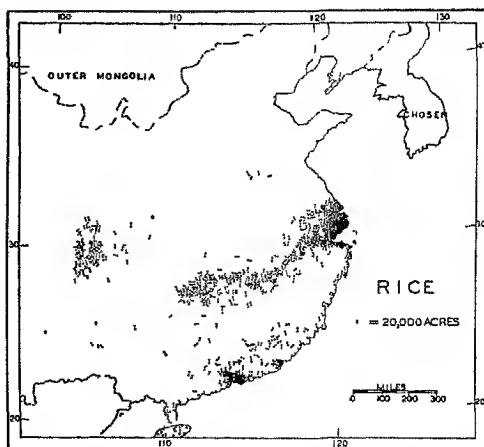
The major geographical regions of China

fuel oil have been installed on boats. Their owners row from place to place and make contracts to pump water from canals to fields.

Regional differences in agriculture. The agricultural industry is not the same in all parts of China. The crops and cropping systems of the Hwang Ho Valley differ from those of the Yangtze and Si valleys. This agricultural diversity is due chiefly to differences in climate and secondarily to differences in relief. The Hwang Ho Basin has a climate much like that of the American Corn Belt—very cold winters and warm, humid summers. The climate of the Yangtze Basin might be compared with that of the American Cotton Belt. It is humid, subtropical, with a long growing season of approximately 300 days. The Si River Basin, located in the extreme southern part of the country, may be compared climatically to the West Indies. The year-round growing season of this southern region makes it possible to grow crops at all seasons, and the native vegetation is tropical in character.

The Si River Valley. The Si or West River Valley is one of the most intensively cultivated of the agricultural regions of China. (See map above.) The hot, moist summers and warm winters make

it possible to grow crops in all seasons. Although it is an area of abundant rainfall (approximately 70 inches a year), additional water is obtained from innumerable canals and streams. The intensive system of agriculture calls for large amounts of fertilizers. Commercial fertilizers are readily available, because of the cheap ocean and canal transportation. The Si Delta is the largest single market area for commercial fertilizers in all of China.



A dot distribution map showing the rice-producing areas of China. Note the importance of the Yangtze Lowlands, the Red Basin, and the Si Kiang Valley in rice culture. Each dot represents 20,000 acres.

The cultivated land is devoted chiefly to rice, sugar cane, cotton, tobacco, and mulberry. Rice is the all-important crop of the region (Map above.) In some districts two and even three crops of rice are obtained annually. Where two crops are grown in succession, the first is set out in March and harvested in July, whereas the second is transplanted in July and harvested in October and November. Sugar cane, cotton, and tobacco are crops of secondary importance. The large mulberry acreage in the Si Delta indicates the importance of silk culture in this part of China.

The other major economic activity of the region is commerce. Here Canton, Kowloon, and the British port of Hong Kong are the chief commercial centers. From the Si Delta and the adjacent coastal lowlands great numbers of Chinese have emigrated to other parts of the world. Some of them have become prosperous merchants in the coastal cities of Siam, French Indo-China, the East Indies, and the Philippines. Many of them have returned to the old homeland, after accumulating a substantial sum of money in foreign fields, bringing back not only money but also new ideas. The modern industrial and commercial developments in Canton bear witness to these contacts with foreign areas and peoples.

Living on waterways. In China, especially in the densely populated parts, the people make much use of the rivers, streams, and

canals. The Chinese catch fish in them, transport goods on them, and even live on them in curious river craft. In the densely populated Canton area, where there is a maze of waterways and a great demand for land, several hundred thousand people live in houseboats. These river craft vary from the sampan or small rowboat, to cargo flats, and seagoing junks.

Southeastern Maritime Region. The Southeastern Maritime Region comprises the humid coastal area which extends northward from the Si Delta to the lowlands of the Yangtze River. The region consists of numerous independent river basins, which are cut off from the interior by highlands. In the seaward parts of the basins, trade centers have developed, such as Foochow at the mouth of the Min River and Amoy at the mouth of the Lung River. The early American trade with China took place at these coastal centers. New England clipper ships obtained their cargoes of Chinese tea chiefly at Foochow.

The economic life of the Southeastern Maritime Region centers mainly about agriculture, commerce, and fishing. Most of the inhabitants are farmers, who grow rice wherever a sufficient amount of water and level land are available. Fortunately the region has an abundant rainfall, and most of the coastal lowland districts produce two crops of rice a year. During the winter season a third crop, consisting of wheat, barley and vegetables, may be grown on the same land. But only 10 per cent of the region is classified as level, and rugged relief sets the upper limits to the cultivated area. The population density is therefore very high in the level lowland districts. Fortunately many of the people of the region can obtain food from the sea, while others gain a living by means of commercial activities.

Southern Highland Region. The greater part of southern China consists of highlands. A vast mountain and hill country extends westward from the Maritime Region to the high tableland of Tibet. The eastern part of the region is the more accessible for trade and has the greater precipitation. Here approximately 17 per cent of the total land area is under crops, whereas the western part has less than eight per cent of crop land. The eastern part of this Southern Highland Region is the foremost tea-producing area in China. But the greater part of the cultivated land is devoted to rice, all of which is consumed at home. The western part of the region is noted for the production of metals. It contains the province of Yunnan, China's leading source of tin.

Economic importance of the Lower Yangtze Plain. The Lower Yangtze Plain is one of the two largest areas of level, fertile land in all of China. Economically, it is the foremost region of the country. Its humid, subtropical climate enables crop production during winter as well as summer. A maze of waterways offers cheap transportation, and the Yangtze itself enables contact with the outside world. The region has an average population density of 650 people to the square mile of land, and contains a number of important cities. Shanghai, China's leading port; Nanking, the capital of the country, and the Wu-Hau cities (Wuchang, Hankow, and Hanyang) are all located in this lowland region.

Agriculture in the Lower Yangtze Plain. In this humid, level region of China, very little farm land is idle either in winter or summer. Here the most important summer crops are rice, cotton, and beans, while fall-planted crops consist mainly of wheat, barley, and broad beans. In the delta part of the region much land is also given to mulberry. More land is devoted to rice than to any other crop, especially in the area of the Yangtze Delta, where a network of canals facilitates irrigation of the paddy fields. Cotton is grown in all parts of the lower Yangtze Plain. It is an important cash crop, large quantities being consumed by the textile mills in and about Shanghai.

Great care is taken to maintain the fertility of the soil. In the canal districts the fertile sediment that settles in the canals is removed and spread over the adjacent crop lands. Waste vegetable materials, rice chaff, and farmyard refuse are all applied to the fields. In some districts even the grasses and weeds are cut into bits and worked into the mud of the rice fields. Commercial fertilizers, such as beancake and mineral mixtures, are but little used.

Comparatively little of the fertile land goes to waste. Here and there may be seen ancient burial mounds, which in some districts occupy five per cent of the land. The farmhouses are clustered together into compact little hamlets and villages. Wide highways are essentially lacking in the rural districts. On the other hand, narrow wheelbarrow highways and footpaths are conspicuous features in the landscape. But even these narrow trails follow the poorer land, such as the ridges adjacent to the canals.

A fertile basin in West Central China. The western part of the Yangtze Basin contains a highland-rimmed lowland that is called the Red Basin. (Illus., p. 578.) This region is separated from the Lower Yangtze Plain by the narrow gorge of the Yangtze Valley.

The Red Basin is therefore shut off from the rest of China by natural barriers. Contact with the Lower Yangtze Plain is established by means of navigation on the Yangtze River. But that involves a voyage in shallow river barges through the rapids at the long Yangtze gorge. These vessels have to be pulled across the shallow parts of the rapids by great numbers of Chinese coolies, who walk along the river banks and tug at long ropes that are fastened to the river barges. Such transportation is slow and by no means as cheap as the low coolie wages seem to suggest.

In spite of inaccessibility, the Red Basin has become one of the most densely peopled areas in all of China. One of the level districts within the basin, known as the Chengtu Plain, has a population density of more than 2,000 people to the square mile of land. It is therefore one of the most densely populated districts in the entire world. Such great population density is made possible because of a very intensive system of irrigation agriculture. The Chengtu Plain is located on the Min River, a major tributary of the Yangtze. The waters of the Min are diverted into a great network of canals for the purpose of irrigating the land.

The economic life of the Red Basin centers about agriculture. Rice is the most important crop and occupies the land to the extent that rainfall, irrigation facilities, and the character of the land will permit. Since the rainfall is much less than in the Lower Yangtze Plain, the proportion of land devoted to rice is also less. But where irrigation is widely practiced, as in the Chengtu Plain, approximately 80 per cent of the land is devoted to rice culture during the summer season. On the drier land of the basin, corn, kaoliang, and millets are grown during that season. Moreover, the mountain rim shuts out the cold winds during winter, and crops may be grown the year round. The winter crops generally consist of wheat, barley, rape, and beans.

The most important river of China. The Yangtze River opens up the interior of China to the outside world. It is the only one of the large rivers of the country that makes possible transportation by ocean vessels for any considerable distance inland. The Hwang Ho is too shallow and contains many sand bars, and the Si or West River contains numerous rapids. The Yangtze, on the other hand, is navigable during the summer season to Hankow, a distance of 680 miles inland, for ocean-going vessels whose carrying capacity does not exceed 10,000 tons. River barges travel to Ichang, a

distance of 1,000 miles from the sea. Beyond Ichang vessels must be taken through the rapids of the Yangtze gorge. Here navigation is extremely hazardous, and coolie laborers are engaged in pulling the shallow Chinese junks through the rapids.

The North Yangtze Highlands. The Yangtze Valley is shut off from North China by east-west-trending mountains, which together make up the North Yangtze Highland Region. This mountainous region is important chiefly because it protects the Yangtze Basin from the cold monsoon winds of winter. As these winds sweep outward from the plateau of Mongolia they bring extremely cold weather to the Hwang Ho Valley of North China, whereas the Yangtze Basin and areas farther south are not affected. During summer, on the other hand, when the monsoon winds blow inland and northwestward from the ocean, the greater rainfall is experienced south of the North Yangtze Highland Region, and most of North China has a light and irregular precipitation.

As an economic unit, however, the North Yangtze Highland Region is of but little importance. Agriculture is centered in the valleys, and many of the slopes are bare and badly eroded. Forests are found chiefly in the inaccessible highland district, and exploitation of the timber stands is handicapped because of inadequate and expensive transportation.

The Great Plain of North China. This lowland constitutes the largest compact area of level land in the whole country. It covers approximately 125,000 square miles and contains 81,000,000 people. It consists of the plains of the Hwang Ho that have been formed by the deposit of river sediment. Here the Hwang Ho has repeatedly changed its course, flooding large areas, so often, in fact, that the river is called "China's Sorrow." The Great Plain is, therefore, remarkably level and after heavy rains vast stretches of land are covered by standing water.

Economic life on the Great Plain. Like other regions of China, the Great Plain is mainly an agricultural area. But rice is not the chief crop in this region, although some early-maturing rice is grown in the southern districts of the plain. The environment is not suitable for the widespread cultivation of this cereal. The region has a climate much like that of the western or drier part of the North American Corn Belt. The precipitation ranges from 20 to 27 inches a year, and shows an irregular distribution. Droughts and dust storms prevail during the winter half-year, or from October to



Distribution of kaoliang, the characteristic spring-sown crop of the Hwang Ho Basin. Note the importance of this cereal in the Great Plain of North China. Each dot represents 20,000 acres

April. Moreover, much of the soil is too porous for successful irrigation. Under such conditions rice culture will not thrive.

The chief crops of the region are kaoliang (gram sorghum), corn, millet, soybeans, and winter wheat. Corn and soybeans are commonly planted on the same land after the harvest of winter wheat in early June. Corn and soybeans are therefore known as summer crops. Kaoliang is the leading spring-planted crop, being sown in April. (Map at left.) This crop is used as food, forage, and construction material. The people consume the seed, the animals

eat the leaves, and the stems are used for screens, matting, and in the construction of homes. North Chinese farmers often build houses of sun-dried mud reinforced with the stems of this plant. Most important of the fall-sown crops is winter wheat, which occupies one-half to three-fourths of the cultivated land. The Great Plain is, in fact, the leading wheat-producing region of the country. Millet is generally grown in the drier districts of the Great Plain.

MANUFACTURING

Cottage and workshop industries. China, like India, depends largely upon the output of the cottages and workshops for the many different kinds of manufactures consumed by her inhabitants. Although modern factories are found in the larger cities, thousands of rural villages in the interior of the country have poor transportation contacts with the outside world and even with other parts of China. Their people must therefore depend chiefly upon the products of the small local workshops and the home industries.

The making of clothing, straw-plaiting, metal manufactures, porcelain works, potteries, flour and rice milling are but a few of the numerous activities that take place in the homes and workshops in all parts of the country

The modern factory system. Modern industry is spreading rapidly, and it has become well established in the large cities. Among the modern factories are cotton mills, iron and steel plants, silk reeling plants, platinum refineries, and establishments for curing tea and preparing dried eggs

Of these manufactures, the cotton textile industry is the most important and engages the largest number of workers. This industry is centered mainly in Shanghai, where nearly half of the modern cotton mills of China are located. Here the industry is favored by nearness to the cotton-producing districts, access to the large market areas of the entire Yangtze Basin, and the advantage of contact with other areas, since Shanghai is China's leading port.

The modern iron and steel industry of China is located chiefly in the Yangtze Valley, in the area of the Wu-Han cities—Wuchang, Hankow, and Hanyang. Here iron ore and coal are brought into the area from districts less than 50 miles away. But the high cost of the coking coal constitutes a serious hardship to further development. Moreover, in order to understand the future possibilities of China's iron and steel industry, we must also consider the fact that her iron ore reserves would last the United States less than 10 years on the basis of normal consumption in our country.

Advantages and disadvantages affecting modern industry. With cheap labor, enormous home markets, extensive reserves of high-grade coal, and large supplies of home-grown fiber, such as cotton, China possesses a number of advantages for the further development of the modern manufacturing industry. On the other hand, the disadvantages include lack of capital, superstitions, political disturbances, inadequate and costly transportation, high internal taxes, lack of petroleum, and inadequate reserves of most of the other minerals.

THE CHANGING CHINESE

As we have already seen, the Chinese show evidences of a culture which has been passed down through the ages, and the masses of the people still cling to the ancient customs and traditions. There is, however, also some evidence of change, especially a changed atti-

tude of mind toward Western culture. New ideas have come into the country through the ever widening trade contacts with foreign nations. Hundreds of thousands of Chinese have migrated from China to other countries, where they have become prosperous business people. Many of them own and operate tin mines in Malaya, and trade in rubber, tea, and other products of the East Indies. Many of these people return to China bringing with them money and new ideas. Chinese scholars have also contributed strongly to China's awakening. Hundreds of Chinese students are attending schools in Europe and America at government expense, and additional hundreds are given private support. Superstitious beliefs give way as education becomes more widespread. The adoption of Western ideas of dress is also noticeable in some districts. In certain areas, especially the large cities, some of the men may be seen dressed in the latest foreign styles, and some of the women wear silk skirts and silk stockings in place of the plain blue cotton of old. But the great masses of Chinese still cling to the customs that have prevailed for hundreds of years.

Further improvements in the economic and social life of the people will be associated with (1) the increasing application of science in the use of the land and resources, (2) the development of cheap and efficient transportation, (3) introduction of more sanitary living conditions, (4) better education for the masses, and (5) more stable political conditions.

QUESTIONS AND EXERCISES

1. In what ways has China's location affected her development?
2. Give reasons why the great masses of Chinese are poor people.
3. What have illiteracy and superstitions to do with China's economic development?
4. What is the relationship between climate and famines in China?
5. Explain the urgent need for a larger modern transportation system in China.
6. Even in China proper, less than one-fifth of the whole land area is under crops. Why is there such a small percentage of cultivated land in such a densely populated country?
7. Multiple cropping and interculture are common practices in the agricultural districts of China. Define these practices.
8. Why do the Chinese place greater emphasis on crop production than on the raising of livestock?

9. How do people gain a living in the Si Valley of China? What is the character of the land surface and climate of that region?
- 10 Explain the importance of agriculture in the Lower Yangtze Basin. Make a list of the crops that are grown in this region.
- 11 In what ways does the agriculture in North China differ from that of the Lower Yangtze Valley?
- 12 What are the advantages and disadvantages in China with regard to the development of a modern manufacturing industry?

FURTHER READINGS

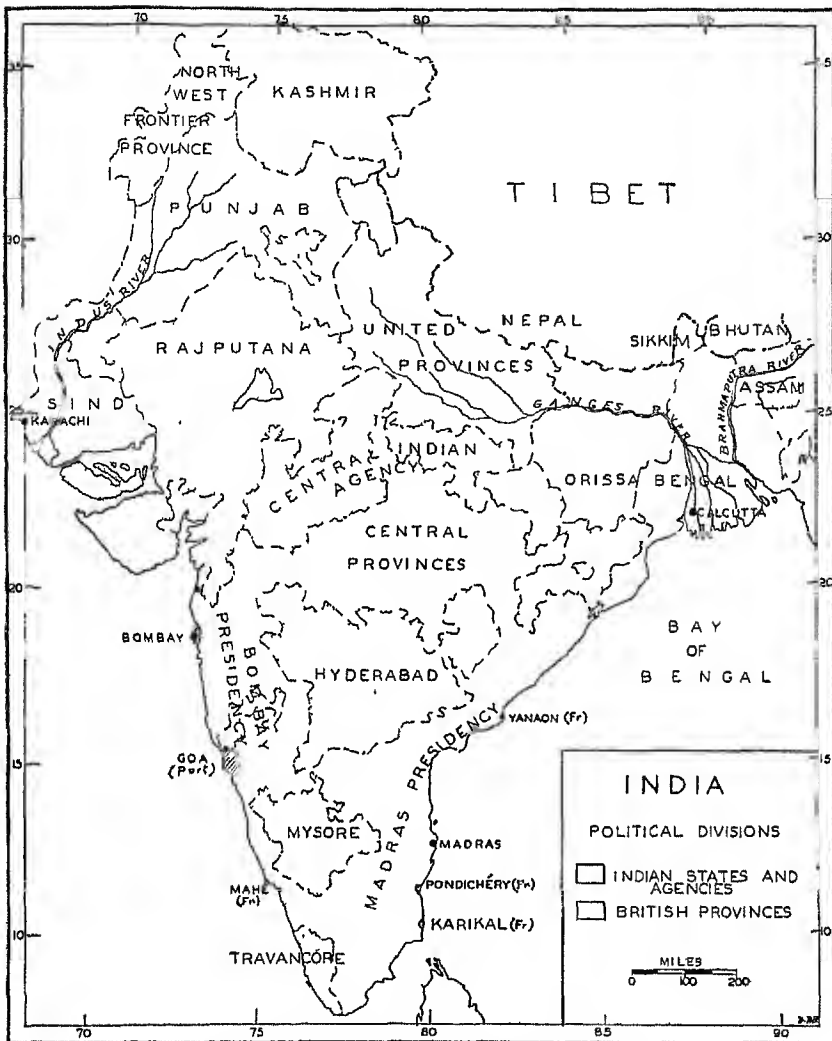
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DISTINGUISHING CHARACTERISTICS OF INDIA

A land of great variety. India is one of the most interesting and important of all the political units of the Orient. Internally the country shows striking diversity from place to place and possesses many distinctive features. It is large in size and, with the exception of China, contains the world's largest population unit under a single government. In fact, within India live more than two-thirds of the people of the entire British Empire. Most of these people inhabit the Indian Provinces, which are governed directly by the British, and together constitute *British India*. Others live in the *Native States*, of which there are more than 500. These States are ruled by native princes who are governed only indirectly by the British. In addition, Portugal and France control small bits of land in the coastal districts of India—remnants from the early days when England, France, and Portugal were competing vigorously for the trade with the Indian natives.

Within these provinces, native states, and small foreign-owned patches of land live the teeming millions of India—people who differ in religion, race, language, and caste. India contains more Mohammedans than Turkey ever ruled, and she is considered the leading Moslem nation. The greater number, or approximately two-thirds of India's population, consists of Hindus. Other major religious groups are the Buddhists, Animists, Christians, Sikhs, Jains, and Parsees. Most of her people can neither read nor write. The last census of India showed that 90 per cent of the entire population was illiterate. One hundred and twenty languages and several hundred dialects add further complexity to the country's social and economic problems.

India as a market. As a consumer of economic goods, India ranks high among the nations of the world. Although most of India's 338,000,000 people (exclusive of Burma) do not consume an abundance and variety of products comparable to those purchased by the great masses in the United States, the tremendous population



The chief political subdivisions of India.

makes possible a large total consumption. Since the average Indian has a low productive capacity, his purchasing power is also low. Major emphasis is therefore placed on the necessities of life, such as foodstuffs and clothing. In thousands of villages, ice boxes, telephones, and automobiles have never been used. Luxury goods are of minor importance. India is one of the leading nations in the consump-

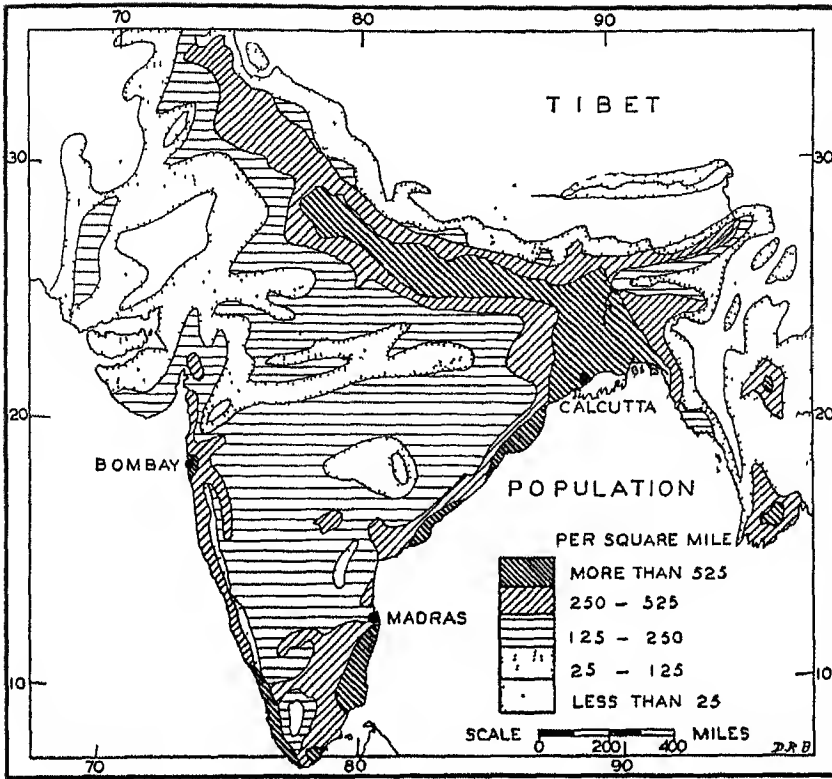
tion of cereals, especially rice, sorghums, millets, and wheat. She is also one of the major consumers of sugar, cotton cloth, machinery, iron and steel products, and mineral oils. Most of the foodstuffs consumed by India's millions of people are produced at home. Yet many products are also imported from foreign countries. To an ever increasing extent, India is drawing upon the economic goods produced in other parts of the world. Even the United States plays an important part in this trade. In fact, the United States now is one of the three foremost nations with respect to India's foreign commerce.

India as a producer. Like most colonial areas, India is distinctive in the production of raw materials rather than manufactured goods. As a producer of food crops this Asiatic country ranks among the leading nations in the world. Together with China, she is one of the two major producers of rice, Japan being a poor third. India leads all nations in the commercial output of tea and jute, and ranks second only to the United States in the production of cotton and tobacco. She is usually surpassed only by Cuba in the production of sugar cane, although the Indian output was the larger from 1930 to 1940. No country is even a close second to India in number of cattle, but many of these cattle are the sacred cows of India. Hindus consider it a sacrilege to kill cattle. Consequently many worthless animals swell the total number. Moreover, India is one of the two leading sources of manganese, the other being Russia.

Although the greater part of her total output of economic goods is consumed by her large population, there is nevertheless a substantial amount available for export. In fact, India generally exports more than she imports. She is one of the eight leading nations in world commerce.

Irregular distribution of population. A study of the map on the next page shows that some parts of India have a very dense population, whereas other areas have comparatively few people to the square mile of land. For example, it will be noted that most of the Ganges Valley and some of the coastal districts have more than 525 people to the square mile, in contrast to less than 25 over large areas located in northwestern India. Most of interior India has from 125 to 250 people to the square mile of land. What are the reasons for this irregular distribution of population?

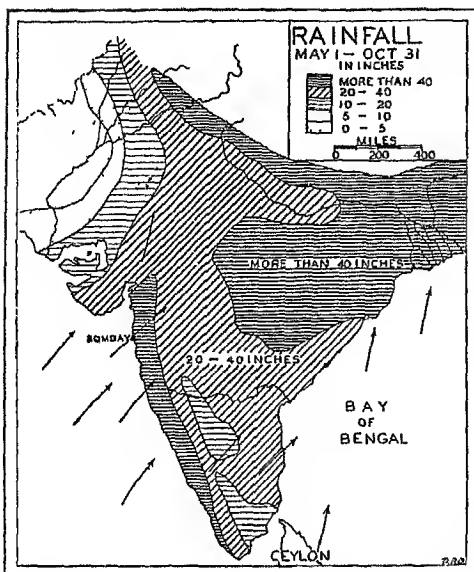
Population and economic opportunities. The uneven distribution of population in India is largely an expression of variations in the opportunity of making a living in the various parts of the country.



The distribution of population in India.

Some areas are favored with a variety of industries and commercial activities, which have attracted many people. These units comprise chiefly the areas in and adjacent to the large urban centers, such as Calcutta and Bombay. Most of India's people, however, make a living by means of agriculture. The opportunities and handicaps associated with this major occupation should therefore be given special consideration. What major factors set the broad limits to the development of agriculture, the dominant activity of India's people?

Climate as related to Indian agriculture. Although agriculture is widely distributed in India, some areas have a marked climatic advantage over other districts in the production of foodstuffs and commercial crops. Since India has a tropical climate, low temperatures do not constitute a handicap to agricultural development. But *rainfall*, with respect to amount and distribution, is a very important



Rainfall of India during the summer half-year. (Compare with map opposite.) Note that summer is the rainy season in India. At that time of year the monsoon winds blow from sea to land as indicated by the direction of the arrows. The rainfall, however, varies greatly from place to place. Northwest India is a desert, whereas the northwestern part of the country receives an abundance of rain.

factor. Thus the lowlands of the Ganges Valley and many of the coastal areas have a heavy rainfall. Such areas produce an abundance of food as well as commercial crops. Many people make a living in these humid lowlands by following an intensive system of agriculture. The population density is therefore high. On the other hand, the arid and semiarid northwestern parts of India are less favored for a widespread, intensive system of agriculture. For example, the Thar Desert of northwestern India is covered with desert grasses and shrubs and inhabited by scattered tribes of desert nomads.

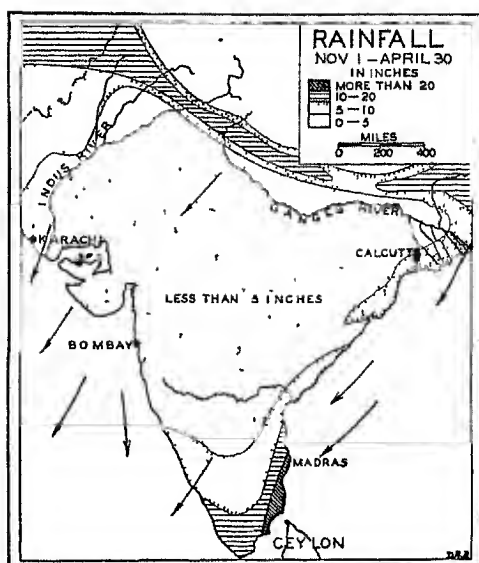
The development of irrigation agriculture, however, has converted some of these dry lands into prosperous agricultural areas. For example, irrigation agriculture makes possible a population density of more than 125 people to the square mile in the lower part of the Indus Valley. Like the Nile Valley of Egypt, this region has become a narrow ribbon of fertility in a tropical desert.

For India as a whole, climate plays an important part. The entire country is subject to the influence of the monsoons—winds that blow from sea to land during the summer season and from land to sea during the winters. Rain-bearing winds are therefore associated with the period of summer, whereas the winters are dry, as the maps indicate. But the monsoon winds are sometimes late in coming, or they may be weak and irregular after the summer season sets in. Under such conditions millions of people suffer because of the inadequate moisture supply. Crops fail, causing disastrous famines and great loss of life.

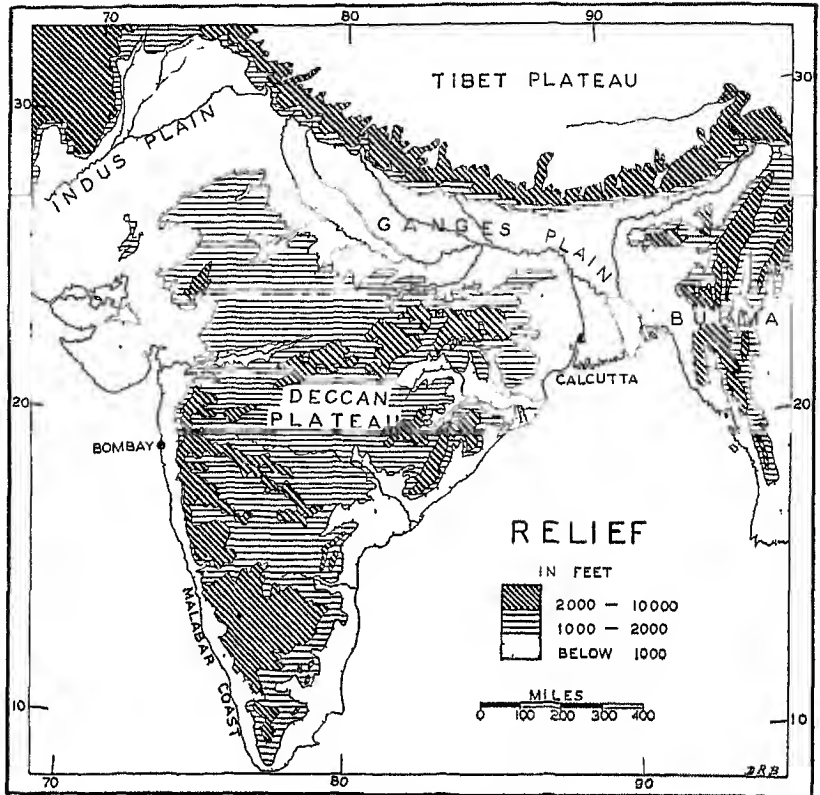
Relief as related to the agricultural industry. In Chapter 3 it was shown that the relief of the land is one of the major factors in determining broadly the upper limits of the use of agricultural land. For example, in India the best-developed areas are the river plains and the coastal lowlands, where the land has become enriched by silt carried from the adjacent highlands. Moreover, in those areas the levelness of the land surface facilitates cultivating and harvesting. There also irrigation, when necessary, can be extended with greater ease than in the highland areas. These lowland areas

have therefore attracted the greater number of India's millions of people. On the other hand, the highlands, such as the Himalayas and Hindu Kush of northern India, contain comparatively few people. Agriculture is confined chiefly to the valleys and scattered clearings on the mountain slopes. Widespread cultivation of these steep-sided highlands would cause excessive erosion and therefore run not only the slope lands but also the adjacent lowlands, on which the eroded material would be deposited.

With respect to the relief factor, several major regions should be recognized in India. The most important relief division of the country is the great Indo-Gangetic Plain, which extends from east to west across the northern part of India (Illus, p 594). On the north, east, and west this strikingly level plain is bordered by mountains, including the Himalayas, the highest mountain range in the world. Great numbers of people, especially British government officials, move from the Indo-Gangetic Plain during the hot season of the year, when the climate of the lowlands becomes quite unbearable for the average European. To the south of the Indo-



Rainfall of India during the winter half-year. Note that desert conditions prevail throughout the greater part of India in winter, the period of winter monsoon. In general, the winds blow from land to sea, or away from the continent of Asia, as indicated by the direction of the arrows.



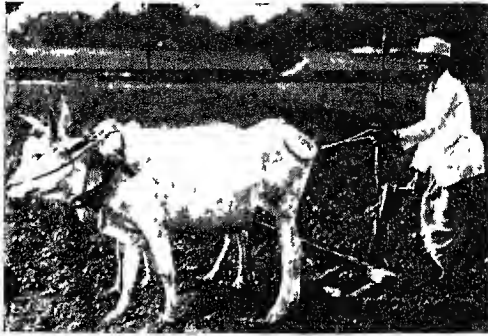
Major relief features of India

Gangetic Plain lies the Deccan Plateau, which is flanked on the east and west by highlands—the Eastern Ghats on the east and the Western Ghats on the west. Along the seaward margins of the highlands one will find the coastal plains of peninsular India. One of the most noted, historically, is the western coastal plain, known generally as the Malabar Coastal Region.

THE AGRICULTURAL INDUSTRY

Production mainly for the home market. In India agriculture is the dominant activity and the chief source of wealth. More than 72 per cent of the total population is directly dependent upon this major occupation. But the large population that must gain a

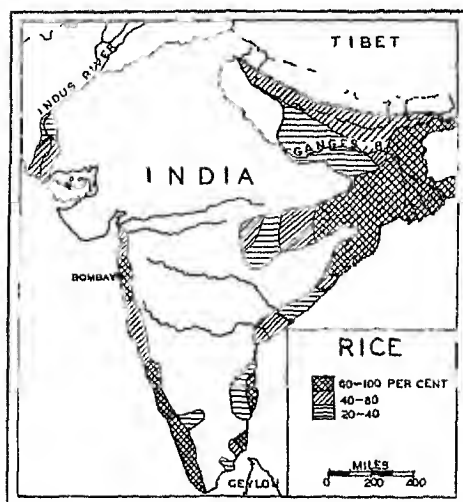
living by means of agriculture has made it necessary that each farmer cultivate a small plot of land. Thus the average Indian peasant, or *ryot*, has but three to four acres of crop land. His tools and agricultural implements are primitive. He is therefore unable to produce much in excess of what he needs to support himself and his family. Thus most of India's people are engaged in satisfying the requirements of the large home market. Yet some parts of the country are well suited by nature for the production of commercial crops.



A common practice of plowing the land in India. Note the wooden plow. Primitive and slow methods are still followed by the great masses of India's population. (Courtesy India State Railways)



An eight-tine seed drill in operation on a government farm in the Central Provinces of India. Evidences of modern agricultural practices in India are found chiefly on the government experimental farms. (Courtesy India State Railways)



The chief rice-producing regions of India indicated in per cent of total cultivated area. Thus in the Delta Region of the Ganges, the rice land occupies more than 60 per cent of all crop land.

than 60 per cent of the total cultivated land. (Illus. above.) The crop is produced mainly during the summer, since that is the season of greatest rainfall. Some districts, however, produce rice also in winter, especially in the low river plains, where the soil remains wet even during the dry season, and where year-around irrigation may be practiced.

The great bulk of India's rice is consumed at home. Although she exports a little rice, her rice imports in recent years have exceeded the exports of that commodity. However, before 1937, when Burma was politically a part of India, the Indian rice exports were enormous, since the exports of Burma were then a part of the exports of India. But since 1937 the Burmese exports have been listed separately, and Burma became one of the greatest rice-exporting countries in the world. Since the population density of Burma is much lower than that of India, she has a great surplus of rice available for foreign trade. Rangoon, Burma's chief city, is one of the leading rice-exporting ports of the world.

Where India's wheat is grown. Within recent years (1930-1935) India has been one of the five major producers of wheat, surpassing Canada in 1933 and 1934. Most of the wheat is grown in the

Rice culture in India. Of India's various food crops, rice ranks first in acreage and in value. Moreover, India ranks with China as one of the two leading producers of rice in the world. The greater part of the Indian rice is grown in the humid lowlands where the rainfall is abundant and the land can be easily flooded. Most important, therefore, are the lowlands and coastal regions of northeastern India and scattered districts along the east and west coasts of the country. In these areas, rice occupies more

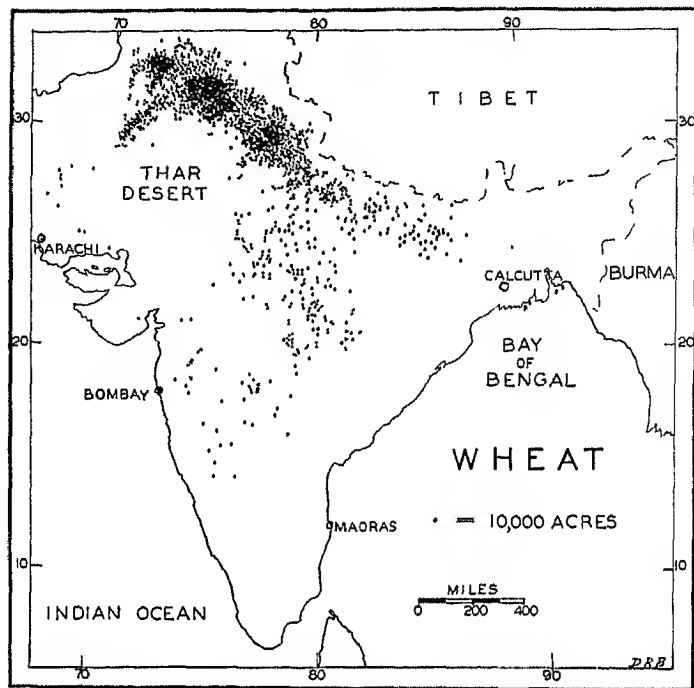


Rice planting near Rangoon, Burma. This primitive method prevails in the lowlands of the Orient. Before 1937, when Burma was politically a part of India, the rice exports of India were enormous. Those exports, however, came from Burma rather than from India proper. (Courtesy India State Railways)

drier northwestern districts of the country (Map, page 598) In general, the crop is not found in the regions of abundant rainfall—that is, in the chief rice-producing districts of the country. The leading producers of wheat in India are the Punjab or “Land of Five Rivers,” the upper part of the Ganges Valley, and the northwestern part of the Deccan Plateau. In these northern and northwestern regions of India, wheat is grown during the cool season or winter. Wheat is, therefore, called a “dry-season crop,” since India’s winters are dry.

In the drier districts of the Punjab, wheat culture is made possible because of irrigation. In this tropical region hundreds of canals make it possible to grow crops throughout the entire year—wheat and barley during winter and millet, maize, and cotton during the period of summer monsoons. Of these crops, wheat has the largest acreage.

Low yields of wheat to the acre. Although India produces approximately 350,000,000 bushels of wheat a year, the production per acre is ridiculously low, being but little more than 10 bushels per acre during the period 1930-1938. Such low yields are due in large measure to the fact that primitive agricultural methods are still in vogue in India. Moreover, much of the wheat is grown under conditions of scanty moisture supply during the dry winter months.



Dot distribution map showing the major areas of wheat production in India

Commercial production of wheat. India is generally considered a major exporter as well as producer of wheat. Yet the exports are very small during some years. A failure of the rice, sorghum, and millet crops, excessive wheat yields in other countries, the world market price of wheat all tend to affect the export of the crop from India. Thus India had an average annual export of more than 50,000,000 bushels of wheat during the prewar period, 1910-1914, whereas the



Wheat harvest in the Northern Plains of India. The Punjab is India's leading area of wheat production. (Courtesy India State Railways.)

average yearly exports from 1930 to 1938 were but little more than 4,500,000 bushels, or less than one per cent of the total production. Most of this Indian wheat is exported from northwestern India by way of the port of Karachi. Find Karachi on the map.

Importance of sorghums and millets. Sorghums (jowar and bajra) and millets occupy a very important place in the Indian system of agriculture. The total acreage of these cereals is surpassed only by rice. Unlike rice, however, sorghums and millets are grown chiefly in the interior parts of peninsular India, that is, in the Deccan Plateau, where the scanty and irregular rainfall, together with rugged relief make rice culture unprofitable. In most of the Deccan, old-fashioned systems of irrigation are used in order to obtain additional quantities of water for the growth of crops. Thus, during the period of summer rains water is collected in thousands of places, thereby forming ponds. These ponds are generally known as tanks. Their water is used in the adjacent crop lands during the dry periods of summer and after the monsoon rains have subsided.

In the Deccan the acreage devoted to sorghums and millets surpasses that of any other crop, the other important crop being cotton. Like cotton, the sorghums and millets are grown during the summer months. Where irrigation makes it possible to produce crops during the dry winter months, wheat and barley occupy the land. Unlike wheat and cotton, the sorghums and millets are grown almost entirely for the home market.

Other food crops. In addition to their production of rice, wheat, sorghums, and millets, the farmers of India grow a number of other food crops. In the middle and upper regions of the Ganges Valley, corn is one of the chief summer crops. Barley is grown during winter in many parts of India, chiefly the northern areas. India also produces large quantities of legumes, especially a crop known as *gram*, which is a kind of pea. This crop not only adds nitrogen to the soil, but it takes the place of meat in millions of homes. In addition, Indian farmers grow oil-yielding seeds, such as the peanut, rape, and flax. These crops are grown for the domestic as well as foreign markets.

Sugar cane. India is one of the leading producers of sugar. She generally ranks second only to Cuba, although from 1930 to 1940 India ranked first in the production of this commodity. The Indian product, however, is a low grade of sugar known as *gur*. Unlike the sugar of Cuba, it does not enter the export trade to any great extent.

Most of the cane sugar of India is produced in the Ganges Valley,



Harvesting sugar cane in the Middle Ganges Lowland. Note the type of workers. This region is India's leading producer of sugar, and India is normally one of the three leading sugar producers of the world. (Courtesy India State Railways)

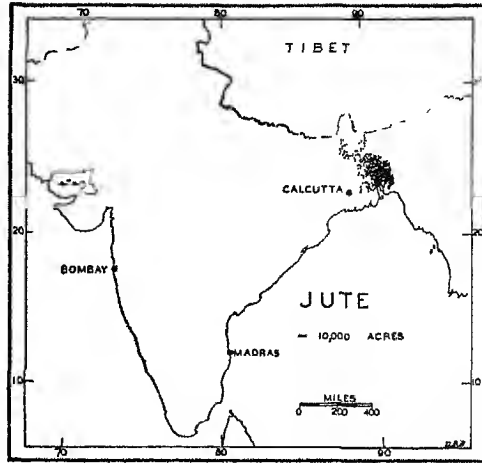
where it is irrigated by means of wells and canals. Unlike the Cuban sugar cane, which is grown on large plantations, the Indian product is grown by the peasants (*ryots*) on their small plots of land.

Commercial crops. Although the greater part of the agricultural output is consumed at home, there are a few commercial crops in which India occupies a prominent place in the commercial world. She ranks first in the export of jute, with more than 90 per cent of the world's total supply. She is also the leading commercial producer of tea, and ranks next to the United States in the production of cotton and tobacco. Moreover, India exports large quantities of oil seeds, such as peanuts and linseed.

Commercial jute production. Of all the fibers, jute is surpassed only by cotton in the number of bales produced each year. Jute is, however, the least durable and least lustrous of all the *hard fibers*, and it is the low price which enables this commodity to play such an important role in commerce. Moreover, jute finds a ready world market at all seasons. It is used mainly for gunny sacks and burlap. Much of the world's sugar, grain, tannin, coffee, and nitrate is sent to market in gunny sacks. Millions of bales of cotton are wrapped in burlap. During the period 1930-1935 the United States obtained

from India nearly 600,000,-000 yards of jute cloth each year. Much of this cloth was used as wrapping material for cotton bales. Some of it was made into gunny sacks.

Where jute is grown. Unlike India's food crops, jute production is much more highly concentrated. Thus more than 90 per cent of the world's jute is grown in northeastern India, in the Delta formed by the Ganges and Brahmaputra rivers (Map at right)

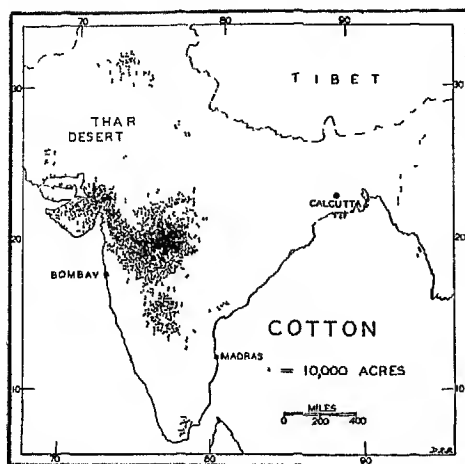


Dot distribution map, showing the area of jute culture in India

This is believed to be the native home of jute, and in this region the cheap jute fiber has long been used in making clothing. The region possesses a favorable natural environment for jute culture. It has an abundant rainfall, high temperatures, fertile alluvial soils, and suitable waters for retting purposes. There is also an abundance of cheap labor—people who have had long experience in the production of jute fiber. The combination of these factors has made it possible for India to produce jute at low costs.

Jute fiber is transported by boat to Calcutta, where much of it is made into gunny sacks and burlap. From Calcutta the manufactured and raw jute are sent to all parts of the world. These products rank among the leading exports of India.

Where cotton is grown. As a producer of cotton, India ranks second to the United States. Moreover, raw cotton is normally India's leading item of export. Most of this crop is grown in the west central part of peninsular India—on the Deccan Plateau. In this region the fertile, black volcanic soils known as *regur* constitute the seed bed for the most extensive cotton culture in the entire Orient. Cotton is also grown by means of irrigation, on the alluvial soils of the Punjab and in the lower part of the Indus Valley. Like the Nile Valley of Egypt, the Indus Valley is located in a tropical desert, and irrigation is therefore necessary.



Dot distribution map showing areas of cotton production in India

Handicaps associated with cotton culture. Most of India's cotton is a low-grade upland variety, which is decidedly inferior to the American crop. It also sells at a lower price in the world markets. Moreover, the average yield of cotton in India is less than 90 pounds to the acre, whereas the United States produces from 150 to 200 pounds of cotton on an acre of land. Why do the Indian peasants produce inferior cotton and

why are the yields so low in comparison with the American output?

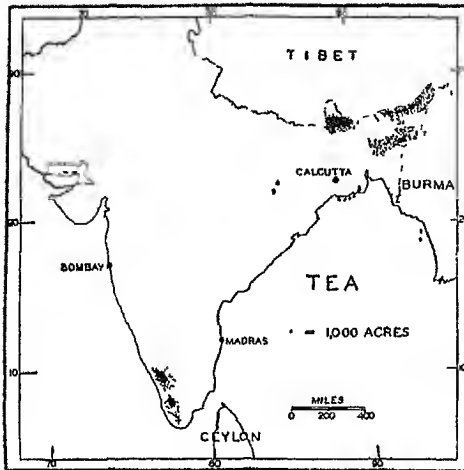
The natural environment of India's chief cotton-producing region, the Deccan, appears to be best suited to short-staple, low-grade cotton. In this region the greater part of the crop is grown without the aid of irrigation. Although the Deccan has a small and irregular rainfall, the black soils, known as "black cotton soils," have a remarkable capacity for retaining moisture. Moreover, the rainfall takes place during the short period of summer, and crop production during the other seasons would require some irrigation. But a widespread system of canal irrigation cannot take place owing to the irregular relief. The greater part of the Deccan was originally covered with lava flows, into which numerous rivers and streams have cut their channels. The irrigation that takes place is chiefly by means of ponds (tanks) formed on the broken land surface where water is collected during the period of summer monsoons. In addition, the problem of producing a sufficient amount of food for millions of people who live in a region of scanty and irregular rainfall makes it necessary that much of the water of the tanks and streams be used for the production of food crops. Thus the Deccan produces short-staple cotton without the aid of irrigation during the summer season. Experience has taught the Indian peasants that their native low-grade cotton will give more dependable yields than high-grade, long-staple cotton, owing to the short period of growth—a period that is determined not by temperatures but by the



In the courtyard of a cotton pressing factory India can sell her cotton at low prices in the world's leading markets because of an abundance of cheap labor. As an exporter of cotton, India is surpassed only by the United States. (Courtesy India State Railways)

Most of the peasants of India are poor and lack modern agricultural implements as well as the necessary fertilizers. Cotton responds readily to the application of fertilizers, which are being used to an ever increasing extent in the United States and in various other cotton-producing countries. In the Deccan fertilizers are but little used. Better farm machinery would help, but the ryot cannot afford it. According to recent census returns, India has less than 20,000 real plows and more than 25,000,000 crooked-stick plows.

Irrigated cotton in India. The best Indian cotton is grown on the fertile alluvial lands of the Indus Basin. The Lower Indus Valley becomes enriched by sediment deposited during the annual floods. The desert climate of the region is comparable to that of Egypt. Like the Nile Valley, the Lower Indus has recently developed a modern system of canal irrigation, and the cultivable acreage has been greatly increased. Here rice, millets, sorghums, and cotton are the chief summer crops, wheat and barley being grown during winter. The dry heat of the region greatly reduces the evils of insect pests and fungus diseases, which are much more widespread in the humid tropical lands of the world. It is, indeed, to be expected that the greatest increase in India's acreage of high-grade, long-staple cotton will take place in these irrigated desert lands of the Indus Valley.



Map showing distribution of tea in India

Where tea is grown. India produces more tea for export than does any other nation. Most of the exported tea is sold to the British Isles and the British colonies. This tea is grown chiefly in two major areas — northeastern and southern India. (Map at left.) In northeastern India the tea estates are confined to the valleys and slopes of highlands located to the north of the Ganges-Brahmaputra Delta. The Upper Brahmaputra Val-

ley contains the world's greatest tea district. In this part of India the abundant rainfall, high temperatures, and well-drained soils favor the industry. Here tea leaves may be picked more than a dozen times during the wet season. Some of the finest tea in the world is obtained from the tea estates of this region. When tea of high quality is desired, only the youngest and most tender leaves are picked. The southern tea region of India also has well-drained soils, abundant rainfall, and high temperatures. Here the rainfall is more uniformly distributed than is that of the northeastern tea region, and because of the nearness to the Equator, the temperatures are high throughout the year. Tea is therefore picked at all seasons at intervals of from seven to 14 days, whereas the northeastern region has a cool, dry period of from three to four months during which growth of tea leaves practically ceases. Cheap labor is available for the picking of tea in both regions.

Since much of India's tea is grown on slope lands, the problem of slope wash and gullyng is a serious one. The first tea gardens in northeastern India were located on the steeper slopes of the highlands, but in the course of time these have gradually moved into the lower mountain foothills and valley terraces, where erosion is less serious. In the southern tea region of India soil erosion is checked by means of terracing and the growth of cover crops.

The future of India's agriculture. For a long time to come India will remain predominantly agricultural. Its great masses will in all

probability long remain on a low plane of cultural development, satisfying their material needs with a comparatively small amount of food and clothing. Considerable inertia must be overcome before any substantial improvement will take place among the teeming millions of India's peasants. In a country which has more languages, religions, and races than one will find in all of Europe, the future agricultural policy should emphasize greater unity among the different population groups. One step has already been taken, but it is chiefly political in character. A single unified government under a new Indian constitution has been approved by the British. But any large degree of representative government could not operate successfully in a land in which more than 90 per cent of the people can neither read nor write. A more widespread system of education is greatly needed. Education will in the course of time break down long-established superstitions. People who believe that "oxen are too sacred to be improved," and therefore refrain from building up a stronger type of work animal, appear to be much in need of modern education.

THE MANUFACTURING INDUSTRY

Handicaps to development of manufacturing. Although India has a large population and a wealth of raw materials, the modern manufacturing industry plays a minor part in her economic life. The greater part of her manufactures are still of the ancient or primitive type. Before the Industrial Revolution, India's manufacturing industry compared quite favorably with that of European countries. Many Indians believe that Britain's economic policy has kept the country in a backward state by encouraging the production of raw materials and discouraging the development of manufactures. But if India had been independent, it is quite certain that it would have been impossible for her to develop a modern industrial civilization comparable to that of Western Europe and the United States. Many features of her social structure stand in the way. One hundred and twenty different languages and hundreds of dialects are spoken in India. More than 90 per cent of the people are illiterate. There are many conflicts between people of different religions, the Mohammedans and Hindus being particularly antagonistic. In addition, the caste system prevents the people from mingling together as freely as a modern industrial system necessitates.

Cottage industries. Of all the manufacturing enterprises of India, the cotton industries are most widespread. Except where perennial irrigation is practiced, these industries make it possible for millions of India's peasants to utilize their time during the dry season. Practically all of her farm people live in villages of mud huts. There are more than 500,000 such villages. Here the cottage industries constitute a major source of wealth. With their crude implements, the village people make many different kinds of economic goods, such as crooked-stick plows, rugs, bowls, pots, metal ware, and clothing. In the rural villages millions of India's peasants produce their own scanty clothing, crude agricultural implements, and simple household equipment. On small plots of land in and around the villages, they grow the necessary food crops. In fact, the village industries make it possible for a large part of the farm population to make a living on very small holdings. In some regions more than one-fourth of the farms have less than an acre of cultivated land per capita. Under such conditions they must manufacture their own goods.

Native textile industries. Before the time of the Industrial Revolution and British political control, the Indian natives manufactured their own clothing, and they had attained a high degree of skill in the art of weaving. But after that time many of the native textile works of India were destroyed by the competition of the power loom. Yet native textile manufacturers are still important and Indian political leaders encourage their further development. They believe that a pronounced back-to-the-spinning-wheel-and-hand-loom movement would help to break British power in India. The possibility of a further development of these industries is suggested by the fact that raw cotton is normally India's leading export, and cotton textiles constitute the country's chief item of import. Much of the cotton is sent to the English mills at Liverpool and Manchester. From these British cities cotton textiles are imported. Moreover, the farm work normally does not give occupation to the agricultural population for more than half of the year, that is, the rainy season. Accordingly, the product of the cottage textile industries should not give way to the imported merchandise. Yet in some sections these industries are losing ground to the modern factory system that has developed in India, chiefly in the large cities. It is generally admitted that the large factories have an advantage over the native industries in the production of cloth at low costs.

The modern factory system. India contains comparatively few factory centers, and less than one per cent of the entire population finds employment in modern industry. The modern factory system does not appear to offer any solution to the unemployment situation in India, since more than nine-tenths of the Indian peasants lack the necessary capital for even one railway journey to a large city. They would have to borrow money from the Indian brokers, whose interest rates range from 12 to more than 60 per cent.

Modern cotton textile industries. Of all the modern factory enterprises of India, the cotton textile industry gives employment to the greatest number of workers, and the value of its output is also foremost. The country contains 352 cotton textile mills which employ approximately 1,000 workers each. The demand for textiles is very large. Cotton textiles are worn by nearly all of the people. The men usually wear a long piece of cloth (some five to six yards) known as the *dhoti*, which is normally wrapped about the body. The dress of the women is known as the *sari*. Light-colored cotton clothing is in great demand in this tropical country, and the large masses of poor people must be satisfied with relatively cheap grades of cotton cloth.

Estimates show that India consumes more than 5,000,000,000 yards of cotton cloth a year. Of this amount, less than 1,000,000,000 yards are imported from foreign countries, the remainder being produced by India's factories and cottage industries.

The most marked development of the modern cotton textile industry of India has taken place in Bombay. Various factors have favored this development, such as (1) location a short distance to the west of the country's major cotton-producing region, (2) favorable transportation contacts with the rest of India, (3) excellent harbor and a favorable situation for world trade, (4) the large and cheap labor supply, and (5) the excellent market afforded by this city with its 1,157,000 people. There is, however, considerable room for further improvement of the cotton textile industry at Bombay. Many of the cotton textile machines are of the old and inefficient types, and most of the factories could be improved greatly in management and organization. They find it difficult to compete with the modern and efficient textile plants of Japan, and within recent years Japan has considerably increased her cotton textile exports to India.

The jute industry. Jute manufacturing, like the modern cotton textile industry, is markedly concentrated. Most of India's 101 jute

mills are located in and around Calcutta, and are therefore located near the world's chief source of raw jute

Although jute fiber has long been used by the natives for the manufacture of clothing, it is now used chiefly for the making of burlap and gunny sacks. The modern industry began during the middle of last century, when the coal fields west of Calcutta were first opened to supply fuel to the railways. After coal became readily available in this region, several jute mills were erected near Calcutta on one of the delta streams of the lower Ganges. Before that time practically all of the jute exports consisted of the fiber rather than the manufactured products. Most of the raw jute was sent to Dundee, Scotland, which became the leading city in the world in the manufacture of gunny sacks and burlap. But by 1908 Calcutta had surpassed Dundee in the manufacture of jute products. The industry at Calcutta was further stimulated during the World War, when hundreds of millions of sandbags were in demand on the Western Front. Within recent years the export (in value) of jute manufactures has been approximately twice as large as that of raw jute.

The iron and steel industry. The iron and steel industry is frequently taken as an index of a nation's industrial strength. On that basis India is one of the weaker nations of the world, since she has not developed a very large iron and steel industry. During most years she mines less than 1,500,000 tons of iron ore and only 20,000,000 tons of coal, which is less than the yearly production of coal in the small European country of Belgium. Most of the coal and iron ore is produced within a radius of 155 miles of Calcutta. Several iron and steel works have been established to the west of Calcutta, where high-grade coal and iron ore are available. Manganese ore is also obtained from points still farther to the west.

India's iron and steel industry is still in its infancy. It is able to compete with the products of western Europe and the United States only because of a protective tariff. Most of the local production centers about the manufacture of iron and steel rails, steel for building purposes, and sheet metal that is later galvanized.

Other industries and future possibilities. Since India possesses a great variety of raw materials, many different kinds of industries have developed. Thus the availability of textile waste materials has given rise to paper manufactures at Calcutta and Bombay. Location of Calcutta with regard to regions of oil seed production, such as linseed in the middle Ganges Valley, has favored the development of

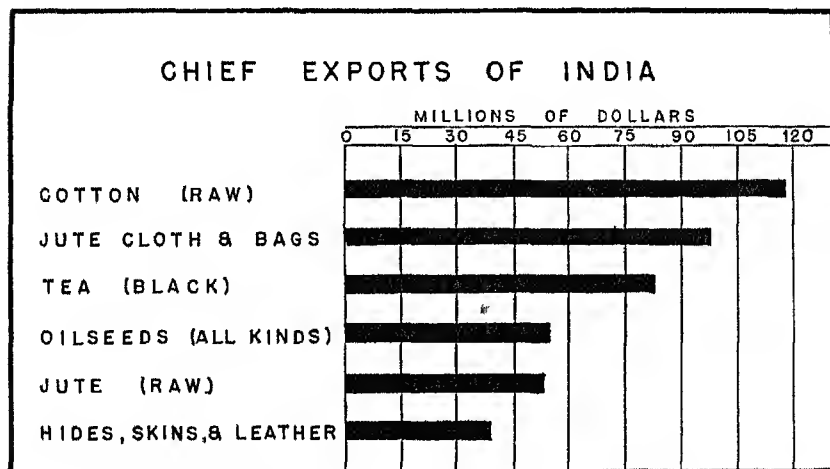
oil mills in that city. Coconut and oil mills as well as sugar refineries have been established at Madras. Several cities manufacture products in which lac is used. India enjoys a world monopoly of lac production. Lac is used in the manufacture of shellac and varnishes.

There is ample room for further development of Indian industry. Labor, though commonly inefficient, is nevertheless cheap. Many raw materials and power resources are but little used. For example, extensive reserves of high-grade coal, iron ore, and manganese ore await further development. Great, unused water-power resources are found in the well-watered southern slopes of the Himalaya Mountains.

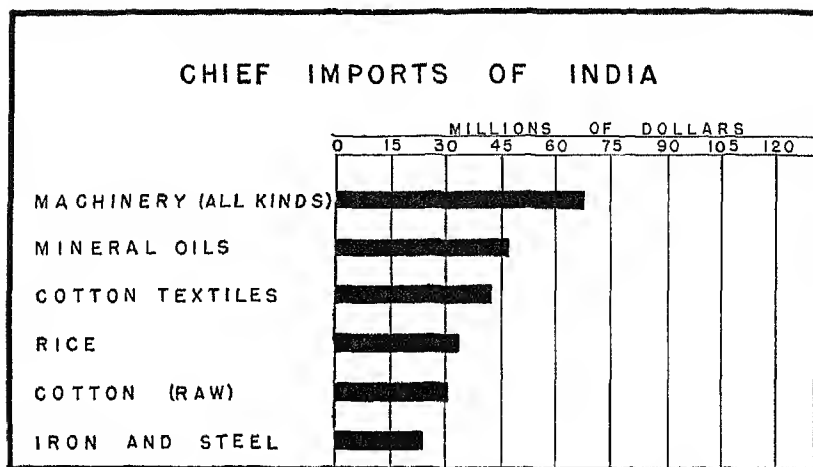
FOREIGN COMMERCE

Importance. Commercially, India is the leading nation in southern Asia and one of the eight foremost nations of the world. Her exports normally exceed imports in value. Moreover, the exports consist mainly of crude materials, which are bulky in character, whereas most of the imports are manufactured goods. Thus the ship cargoes sent out of India are much larger than those received by that country. The excess of exports helps pay for British services in India, such as banking and transportation services.

Exports and imports. The greater part of India's exports consist of raw materials and foodstuffs, such as unmanufactured cotton, tea,



The leading exports of India during the period 1935-40.



Machinery, mineral oils, and cotton textiles have long been important items of import. Rice has become an important item of import.

rice, raw jute, and oil seeds. The chief finished products exported from India are jute manufactures. In value they are surpassed only by raw cotton. (Chart, p. 609.) On the other hand, the imports consist mainly of finished manufactures, cotton textiles being the leading item of this trade. (Chart above)

Trade with the United States. Indian exports to the United States consist mainly of jute cloth, sheep and goat skins, raw jute, shellac, and tea. From the United States, India obtains motor cars and busses, machinery, lubricating oils, and kerosene.

The chief ports. Most of India's long coastal area is poorly equipped with good harbors. The greater part of the foreign trade is handled at five ports. The largest and most important is Calcutta, the great jute port of India. It is also a major outlet for the northeastern tea region and a great receiving port for the Ganges Valley. The port is located on the Hooghly River at a distance of 82 miles from the Bay of Bengal. The channel is crooked and contains numerous sand bars. Continual and expensive dredging keeps the channel open for ocean-going vessels. Next in rank is Bombay, with the best natural harbor of the leading Indian ports. Located on the west coast of India, it is readily accessible to European countries by way of the Suez Canal. It is the chief outlet for the cotton exports of India. Smaller quantities of cotton are exported from Karachi, the major port of the Indus Valley and the Punjab. Karachi has become

the chief wheat port of India. In the development of Karachi extensive harbor improvements were necessary. Madras, the fourth of India's large ports, has no natural harbor. It has a coastal location known as an *open roadstead*. It was therefore necessary to build an artificial harbor. The port of Madras accounts for a variety of exports, chiefly coconut products, wood products, hides, and skins. On the other hand, the trade of Rangoon, Burma—the last of the five great ports of India—is much more highly centered in one commodity—namely rice—in the export of which it surpasses all Indian ports.

QUESTIONS AND EXERCISES

1. How important is India as a consumer of economic goods? as a producer of economic goods? Explain.
2. Study the population distribution map of India. Explain the great difference in population density between the northeastern and northwestern parts of the country.
3. In what ways does climate affect agriculture in India?
4. Where are India's most important rice-producing districts? Why are these districts important? Study your rice and rainfall maps carefully before answering the question.
5. Why is comparatively little wheat grown in the Lower Ganges Region, while the upper part of the Ganges Valley produces much wheat?
6. Explain the low yields per acre of most crops grown in India.
7. Why are the sorghums and millets rather than rice the chief crops grown on the Deccan Plateau of India?
8. Study the dot distribution map of jute in India. Explain the remarkable concentration of jute production in the lowlands of the Ganges and Brahmaputra.
9. Why do Indian peasants produce mainly short-staple, inferior grades of cotton, and why are their yields per acre decidedly low? Explain.
10. What are the handicaps to the development of manufacturing in India?
11. Explain the importance of India's cottage industries.
12. Explain the importance of India's cotton textile industry. What advantages are found in the Bombay area for that industry?
13. The iron and steel industry is frequently taken as an index of a nation's industrial strength. On that basis, what is India's strength? Where are India's chief iron and steel works? Why?
14. Make lists of India's chief exports and imports. What commodities are exported to the United States? What commodities are imported from our country?

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Part V

OTHER SELECTED REGIONS
AND INDUSTRIES

MEXICO AND THE CARIBBEAN LANDS
(MIDDLE AMERICA)

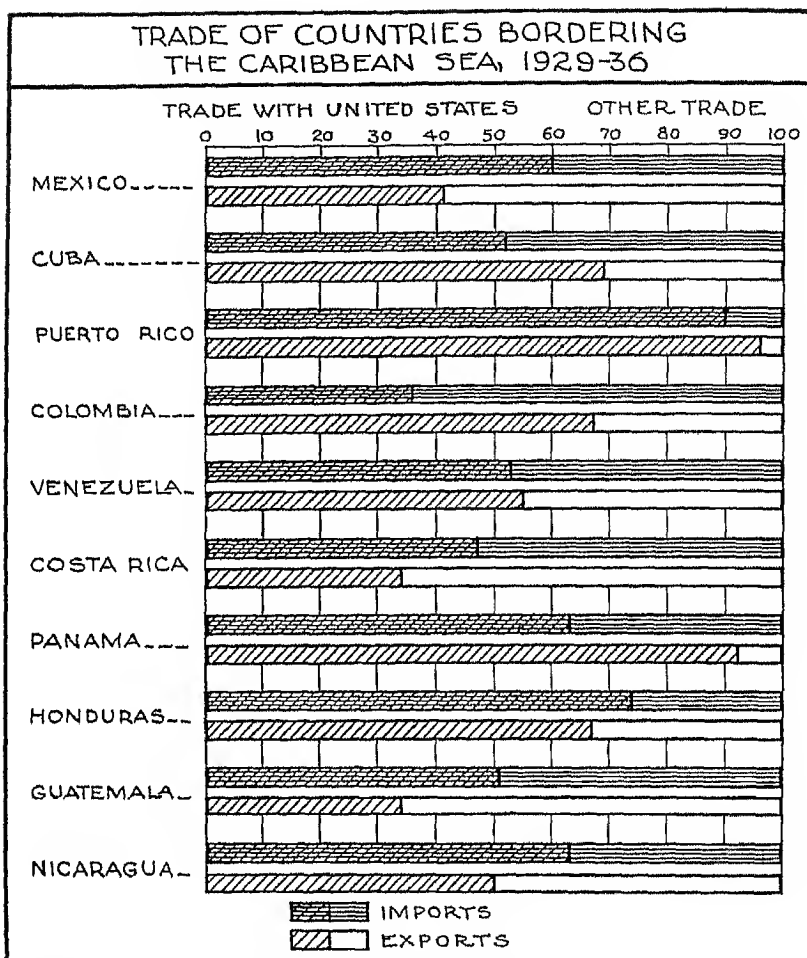
RELATIONSHIP OF THE UNITED STATES
AND MIDDLE AMERICA

Dependence. The United States and Middle America depend upon each other to an extraordinary degree for their present state of progress and well-being. Each area contributes many commodities not produced in the other. Also, the United States has supplied an abundance of capital for the development of Middle America and has received in return liberal profits on the money expended

The greatest contribution of the United States to Middle America is not capital, however, nor commercial products, but something more valuable than either—human energy and ability. Science, resourcefulness, skill, managerial ability, and human fitness are intangible, but also exceedingly valuable, products that have been extensively exported from the United States to our southern neighbors. We cannot afford to boast about these exports, instead we should be thankful that nature has bestowed upon our country climates that stimulate human activity and has endowed us with resources that permit a rather complete and efficient use of this energy. As we shall see later, nature has not been so generous in this respect with Middle America.

Trade relations. In chapter 16, pp. 279-283, the principles underlying the development of trade were set forth. When these principles are applied to the United States and Middle America, we discover that, according to theory, the trade between these areas should be large. Every factor that makes for trade exists here. The areas are close together; they have differences in resources, climates, peoples, and stages of industrial development, and their facilities for trade are reasonably good.

Here, at least, we find the facts fitting the theory. Mexico and the Caribbean lands have a larger trade with the United States than with any other part of the world. More than 70 per cent of Cuba's export trade and 60 per cent of her import trade are carried on with



Much more than half of all the international trade of the Caribbean Countries is carried on with the United States.

her northern neighbor. Similarly, most of the other countries bordering the Caribbean Sea look to the United States to supply them with a large part of their imports, and to purchase most of their exports. During the years 1929-1934, more than one-half of the total foreign trade of Middle America was conducted with the United States. Interruption of this flow of goods would greatly handicap our nation and would be financially disastrous to the Middle American countries.

Use of American capital. The economic development of Middle America has been as dependent upon the United States for capital as it has been for trade. This fact is indicated clearly by the following table:

UNITED STATES INVESTMENTS IN MIDDLE AMERICA

West Indies . . .	\$1,112,000,000
Mexico . . .	635,000,000
Central America . . .	285,000,000

Our investments of \$951,000,000 in the island of Cuba, with a population of slightly less than 4,000,000, represents approximately \$240 per person or \$1,200 for each family of that country. Our investments in Cuba exceed our total investments in any other country in the world except Canada and Germany—countries that have larger populations and vastly greater resources than Cuba.

American capital has been an important factor in the promotion of the great plantations of sugar cane, bananas, henequen (a plant which contains fiber from which binder twine is made), and other agricultural products grown in the republics bordering the Caribbean Sea. It has been essential to the development of petroleum, gold, silver, copper, and other mineral resources of the countries, and it was American capital, ingenuity, and resourcefulness that opened the Panama Canal and developed most of the other Middle American facilities for trade. This flow of capital from the United States to the Caribbean countries has been of great value to all concerned. To the former it resulted in large profits, to the latter it brought rapid industrial progress.

Humanitarian relations. Our interest in Middle America has not been wholly a financial one. American industrialists and philanthropists (men who love to help mankind) have spent vast sums of money in their efforts to improve the sanitation of these tropical lands; to destroy or partially control the dreaded diseases that have been so prevalent in the lowlands of every one of these countries, and to raise standards of living and in other ways contribute to the general well-being of their peoples. American scientists have given unsparingly of their time and energy, and many of them have sacrificed their lives, in this struggle against disease. Doctors, nurses,

chemists, geologists, and civil engineers have given the most productive years of their lives to improve sanitation and to promote industry in these tropical lands. Such sacrifices have not always been without selfish interests, but they have in general resulted in good

Some of the cities that were formerly known as "pest holes of disease," and that had frightfully high death rates, have been made healthful places in which to live. They no longer strike fear in the heart of the white man who needs to reside there for a time. Instead, they are attracting increasing numbers of tourists and vacationists.

Ideal tourist region. The pleasant winter climate, variety of scenery, contrasts of civilization, and places of historic importance and business opportunity are, taken together, factors that attract an increasing number of visitors from many parts of the world. For example, Mexico City makes an excellent resort for tourists, either in summer or in winter. Its average winter temperature is about the same as that of Los Angeles, California, while the average summer temperature differs but little from that of Quebec, Canada. Moreover, this tropical city is situated in the midst of scenic beauty, and is the home of peoples whose customs, manners, and industries differ remarkably from those of typical communities of the United States.

Similarly, the beautiful scenery, the contrasts in civilization, and the healthful and pleasant ocean breezes of the Caribbean coasts are causing these lands to be visited each year by large numbers of tourists. The "Caribbean cruise" is a popular vacation trip, not only during the winter, but in summer as well.

NATURE OF REGION AND PEOPLES

Tropical lands with tropical products. The most densely populated sections of Mexico, and of all parts of the other Middle American countries lie within the tropics. Their shores are bathed by the waters of warm seas, and have a moderate to abundant rainfall that is fairly well distributed throughout the year. Nevertheless, climatic conditions within the area have sufficient contrasts in temperatures, rainfall, and humidity to make the region well suited to a variety of products, such as sugar, coffee, tropical fruits, and henequen. The commercial production of these commodities will be discussed later in this chapter.

Peoples. Mexico is our next-door neighbor, but her population bears little resemblance to our own. In fact, one would have to go to distant parts of the world to find peoples who differ from us more strikingly in their racial characteristics, customs, manners, form of government (except in the name "republic"), and state of general well-being. Similar contrasts exist between the United States and the Caribbean countries.

The mixture of races within Middle America is probably unsurpassed anywhere in the world. The Caucasian, Indian, Negro, and Mongolian races, together with the Mulatta, Mestizo (mixed Indian and Spanish), and Zambo (mixed Indian and Negro) have all been brought together here. Moreover, the white peoples of this region constitute about as varied groups as can be found anywhere. The Spanish are descendants of every range of the cross section of society of Spain, from the most simple peasant to royalty. In addition, the British, French, German, and other European peoples have been assembled in these tropical lands. The region has attracted capitalists, businessmen, and plantation owners from the United States and many European countries.

Geographical conditions have favored racial complexity. For several hundred years the West Indies were situated on the busiest ocean highway in the world. Sailing vessels leaving Europe found it desirable to go southward to the Canary Islands, lying within the belt of Northeast Trades, before turning westward. They were then driven by strong, steady, and reliable winds directly to the West Indies. From here the sailing vessels worked their way northward along the eastern coast of the United States, and finally returned to Europe by the aid of the Westerlies. The Spanish, English, French, and Dutch all made use of this trade route, and all laid claims, at one time or another, to some or all of these tropical islands of the New World. All sent colonists to the West Indies and carried on trade with them.

Since the climate was not conducive to hard work for the Europeans, they quickly enslaved the natives and compelled them to work the plantations and mines. Within a few decades the Indians had been almost annihilated by harsh laboring conditions and by disease. Smallpox, measles, and other diseases brought in by Europeans, but against which the natives had not developed an immunity, sometimes wiped out whole mining crews within a few days. The places left vacant by the death of these Indians were quickly taken

by Negroes imported from Africa. This traffic in human beings which began in 1502, increased until the early part of the 19th century, when the British alone were bringing to the West Indies 20,000 slaves annually. Thus a concentration of Indians, Negroes, Europeans from several nations, and businessmen and traders from many lands, resulted in a complexity of races that is probably unsurpassed in any other part of the world.

Masses of people backward. The peoples of Mexico and of the Caribbean lands are sharply divided into two primary types of society—the upper, ruling classes who possess most of the wealth, and the lower, servile and dependent classes who perform most of the manual labor necessary for the development of commerce and industry, and who receive as pay but little more than the bare necessities of life. None of these countries supports many people who belong to that much-honored, independent, and well-to-do middle class about which the United States and western Europe boast. The masses of the people are poor and possess but few of the conveniences of life and still fewer of the luxuries enjoyed by even the common laborer of the industrial world. Relatively few of the lower classes have the equivalent of an eighth-grade education, and millions of them can neither read nor write.

Negroes and Mulattoes constitute more than one-half of the population of the West Indies. As a rule they are care-free, ease-loving people who give but little thought to the future. The inhabitants of Mexico and Central America are predominantly Indians and Mestizos. In 1930 the composition of the Mexican population was as follows: 4,620,000 Indians; 9,040,000 Mestizos; and only 2,240,000 whites. The Indian population is made up of at least 35 different tribes, who speak almost as many different languages.

These Indians are, for the most part, an ease-loving, unambitious, and illiterate people. They appear to be satisfied to live in mud huts and to be surrounded by filth; they seem content to eat corn bread, beans, and pork, with but little attempt to procure for themselves a balanced diet, and they are willing to leave the control of government to others. They and a large percentage of the Mestizos constitute the exploited and oppressed classes who are poorly paid for their labors.

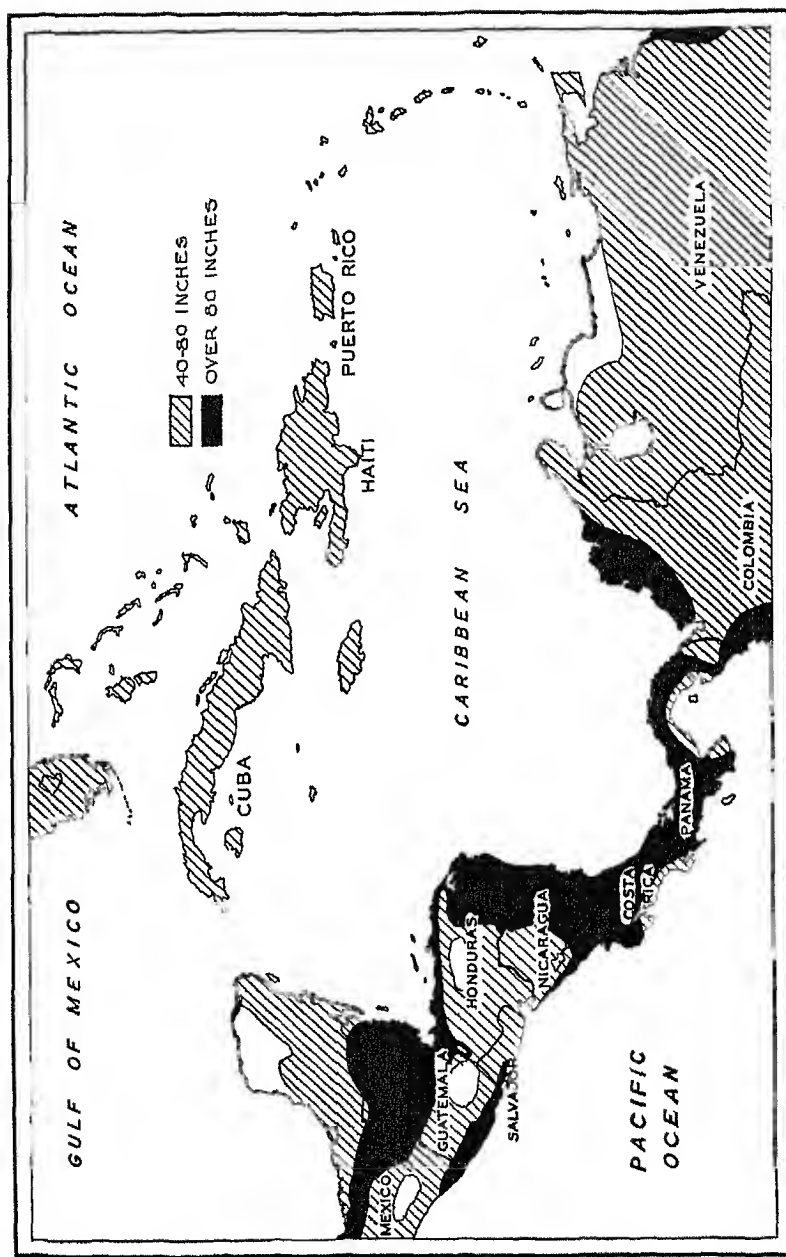
Governments. Such peoples can scarcely hope to maintain a true democratic form of government. Indeed, in most of these countries, the government is democratic in name only. As a whole there are

few places in the world where governments have been less stable than in the countries bordering the Caribbean Sea. Now and then a strong man is put in a position of power, who succeeds in keeping order for two or three decades. Even under such conditions it is possible for the dictator to rule for the benefit of his friends rather than for the good of his country.

There are indications that in some of these countries revolution has at times become a "business." Men who are not in power try to gain control of the government, so that they may exercise authority over the revenues of the country. Too frequently the army follows the most liberal paymaster without questioning the intentions of its leader. Sometimes foreigners, in order to promote their own selfish interests, gain a large measure of control in some one of these countries. The purpose of these foreigners is to gain control of the revenues of the country, or to be granted special favors for the development of mines, plantations, or transportation facilities. Some of the dictators have treated state property very much as though it were their own. They have confiscated private property freely, and have given but little thought to the personal liberties of the people.

Climate and health. Perhaps the factors that have contributed most to the backward state of the Caribbean peoples are the hot, moist climate and the poor sanitation which characterize a large part of the lowlands. Some of the highlands have an exceedingly pleasant climate and are relatively healthful. The hot, wet lowlands, however, have a high humidity of atmosphere which checks the evaporation from the body and prevents sufficient perspiration. Consequently, impurities that should pass out through the pores of the skin are thrown back on the kidneys and lungs. These organs are incapable of carrying the load efficiently, and ill-health results. Under such atmospheric conditions the white man's energy is sapped and his vitality is weakened to such a degree that he quickly and easily falls prey to disease.

The hot, wet climate which is so poorly suited to man is ideal for the multiplication of his worst enemies—disease germs and disease-carrying insects. (Illus., p 622) Yellow fever, malaria, dysentery (an intestinal disorder), hookworm, infectious sores, and many other diseases were for hundreds of years a constant source of danger within the lowlands of the Caribbean countries. Because of outbreaks of infectious diseases, many of these tropical ports have been kept under quarantine for days or even weeks together.



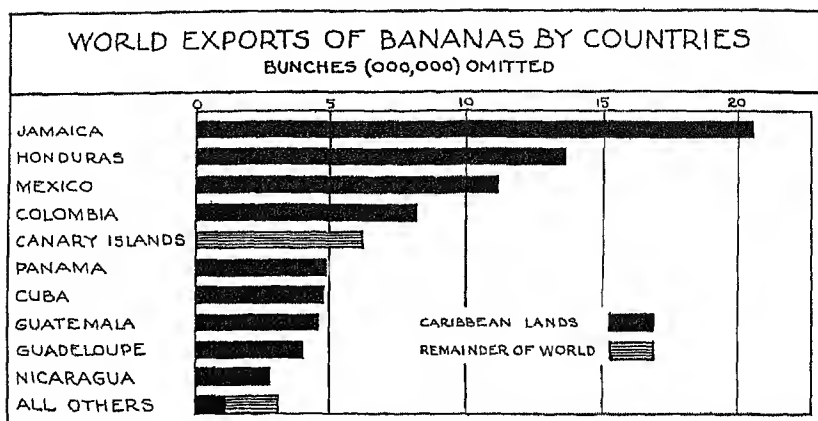
The hot, wet climate of much of the land bordering the Caribbean Sea is unhealthful, but it is well suited to bananas, sugar cane, and other tropical agricultural products.

Armies of conquest have at times suffered tremendous losses from disease; the construction of railroads in unfavorable places has cost hundreds of lives for each mile of track laid; and on many occasions fruit companies have sustained great financial losses because of sickness among their laborers.

The conquest of the Caribbean. Science deserves much of the credit for the rapid economic development of the Caribbean lands during the present century. Many doctors and nurses have risked their lives in order to discover the causes and remedies of deadly tropical diseases. Civil engineers have made similar sacrifices in order to drain swamps, build railroads, develop plantations, or in other ways improve sanitation and carry on constructive programs. The scientists laid the foundation for the improvement of the health of the natives and also for guarding the health of European peoples. Business developments rapidly followed. Mines were opened, canals, railroads, highways, and bridges were built, and plantation agriculture was developed on a scale never before known. This conquest of the adverse forces of nature has been brought about by an army of scientists working with microscopes, medicines, and machines of construction. It is intended to bring health, happiness, prosperity, and other blessings to mankind. It is a far nobler type of conquest than that waged with guns, battleships, and other implements of warfare which bring sorrow and suffering.

PLANTATION AGRICULTURE

Highly developed. Plantation agriculture has probably reached its most scientific and, at the same time, its most extensive development within the Caribbean Region. In favored locations, banana plantations stretch many miles along the coast and extend miles inland. On some of the plains of Cuba, sugar cane plantations extend in one continuous tract as far as one can see. Pineapple, tobacco, henequen, and other plantation crops are widespread throughout the Caribbean area. Most of this great development has taken place during the last half century. The natural environment—climate, soil, etc.—has always been suited to these crops. It is only recently, however, that the skill and science of doctors, nurses, civil engineers, soil experts, geologists, economists, and other scientists have conquered this environment so that plantation agriculture within the region has become relatively safe and profitable.



The low, hot, wet coastal land bordering the Caribbean Sea grows more than 85 per cent of the world's commercial crop of bananas Exports for 1935-36.

THE BANANA INDUSTRY

From subsistence crop to commercial crop. For centuries the banana has constituted an important food item for many millions of tropical peoples. In many parts of the tropical world it, together with its close relative, the plantain, has provided the major food supply of the people throughout a large part of historic times. In parts of central Africa it was the "staff of life," and if for any reason the crop failed, famine resulted.

Trade in the fruit is a development of relatively recent origin. Prior to 1870, very few people of the United States had ever seen a banana. As late as 1885, trade in this fruit was confined chiefly to a few coastwise cities. Earlier than this, when occasionally bananas were shipped to the interior of the United States, the fruit was almost always overripe and in a poor state of preservation before it reached the consumer. These conditions have been greatly altered during the last 50 years, and today the banana is a common article of diet for hundreds of millions of temperate zone peoples.

PROBLEMS OF COMMERCIAL BANANA DEVELOPMENT

Natural environment and commercial culture. Requirements for the growing and marketing of bananas are very exacting, and the



The tender and rapidly growing banana plant cannot stand strong winds without great damage to the plant. A tropical cyclone has completely destroyed the crop of this plantation. (Courtesy United Fruit Company)

early commercial developments were associated with great cost of human life, and extraordinary risk of financial loss. The climate best suited to banana culture is poorly suited to the white man. The fruit possesses the finest flavor and the yield is most abundant when grown in the moister parts of the jungle land bordering the Equatorial Rain forests. Most of the world's commercial crop is grown on the flat coastal lands bordering the Caribbean Sea. Ideal banana-growing conditions are found in those regions receiving an annual rainfall of 60 to 80 inches well distributed throughout the year, and having temperatures which range from 65 to 85 degrees Fahrenheit.

Such climatic conditions foster jungles. In many places the trees are interwoven with vines, and the undergrowth is so thick that man cannot make his way through the wilderness without cutting a roadway as he goes. The physical task of clearing such land is great, and the struggle to keep it clear is continuous. If the plantation is deserted for two years, trees and vines grow up to such an extent that the task of reclaiming the plantation is almost as great as that of developing a new one. These conditions, together with the lassitude (laziness) of the natives and the constant danger of diseases,

made the early development of banana culture difficult, dangerous, and expensive.

The banana tree cannot stand strong winds. Its broad leaves, heavy stem of fruit, and tender trunk result in destructive "blow-downs" with every strong wind. Unfortunately, the greatest banana-growing area in existence, the Caribbean coastal lands, is situated in one of the worst hurricane zones in the world. It is not uncommon, therefore, for the banana crop to be completely ruined in some part of the region each year. Since these commercial fruit-growing areas are widely distributed from southern Mexico to the northern coast of South America, any given storm destroys but a small percentage of the total Caribbean crop.

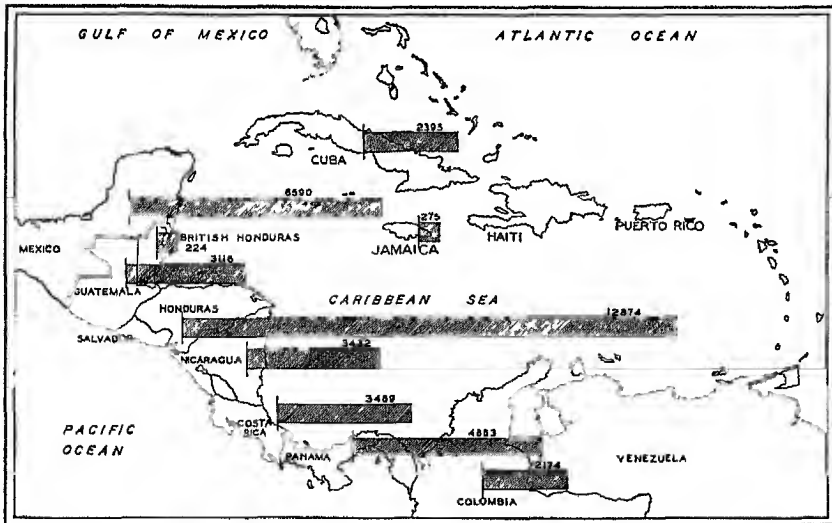
Marketing bananas. The task of growing bananas is no more difficult than that of marketing them. The fruit is exceedingly perishable and must be transported quickly from the field to the consumer. (Picture below) Moreover, the temperatures and air



A banana plantation tramway. Bananas are highly perishable and must be delivered to the market quickly after they are cut. The heavy rainfall of the area causes deep mud, but with this tramway the planter delivers bananas to the nearby railway station in a relatively short time after cutting. (Courtesy United Fruit Company)

conditions of banana-carrying ships and railroad cars must be regulated carefully during transit. The harvested fruit can stand neither hot nor cold weather if it is to be preserved for any considerable length of time. Consequently, both the United States Government and the major fruit companies have expended large sums of money in experimentation to determine the best atmospheric conditions for the preservation of the fruit. Moreover, large fruit companies have developed and coordinated transportation facilities in such a manner as to speed shipment and delivery, and thereby to reduce the loss resulting from decay.

The United States regularly imports and consumes more than one-half of the entire commercial banana crop of the world. (See map below.) This pre-eminent position in the banana trade is largely the result of (1) our proximity to the Caribbean Region, (2) the high standards of living attained by the masses of our people, (3) the efficient marketing organizations that have been built up by American companies, and (4) the excellent transportation facilities that have been developed both within the United States and between this country and the Caribbean lands.



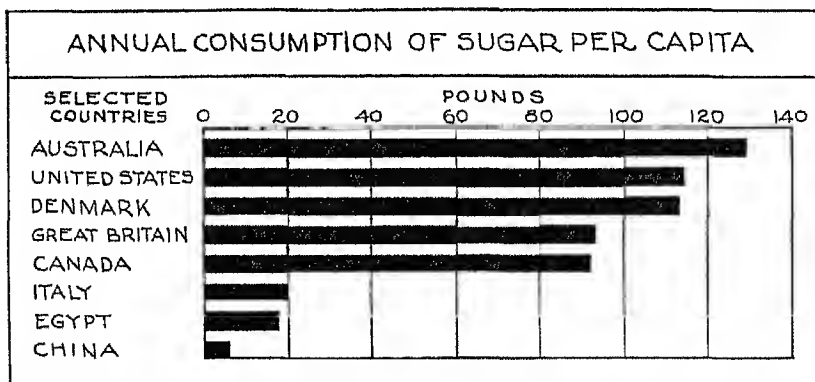
More than 60 per cent of the world's commercial crop of bananas is marketed within the United States. Numbers above the bars represent thousands of bunches marketed within the United States. Average for years 1930-35. (Compare with Illus. p. 624.) Why does such a small percentage of Jamaica's crop reach the United States?

THE CANE SUGAR INDUSTRY

History of development. Sugar is a food that has been produced from cane for several centuries, but its high cost, prior to 1700, practically limited its consumption to the wealthy. Sugar was first produced in the Orient. During the early period of its manufacture it was a sticky brown product of low quality, that spoiled rather quickly. Being of a perishable nature, it did not enter to any considerable extent into the slow-moving caravan trade that was so highly developed during the Middle Ages between the Orient and Europe. During ancient and medieval times the masses of the people had to go without sweets or satisfy their desire for these foods by the use of honey, and the juice of maple trees.

Beginning in ancient times sugar cane production gradually worked westward into Mediterranean Europe, but the crop was not well suited to the winter rains and summer drought of this area, and sugar remained a luxury until the opening of the eighteenth century.

During the last 250 years sugar manufacturing has increased rapidly, and the product has been shipped to every occupied part of the globe. As a consequence, it is today the most widely used food in the world. Although it is consumed by all peoples, and finds its way into the least accessible places, the per capita consumption is by no means equally distributed. There are still a few hundred million poor people in China and in other backward regions to whom sugar remains a luxury.



Although some sugar is consumed by all peoples of the world, this food is still a luxury in large parts of China and in many other parts of the world.

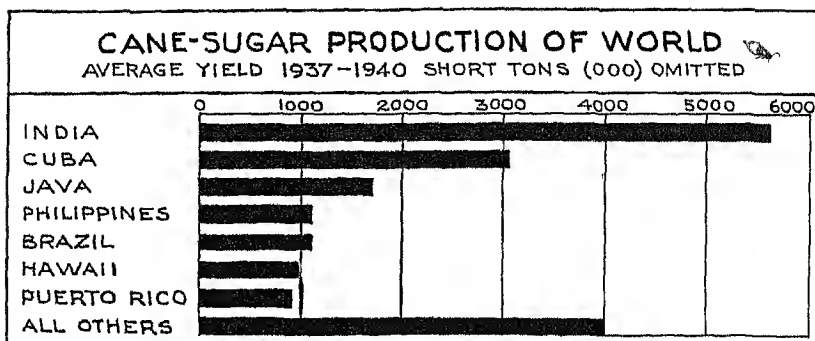
Commercial sugar production in Tropical America. The first important *commercial* sugar industry grew up in Tropical America. It was the development within this region, during the eighteenth and nineteenth centuries, that made sugar inexpensive and brought the price within the reach of the laboring classes of the Western world. This development within Tropical America was largely a response to three factors: (1) the excellent natural environment of the New World for the cultivation of sugar cane; (2) the discoveries which improved the processes of sugar cane manufacture; and (3) the use of Negro slaves on the hot, moist, unhealthful sugar plantation.

Natural environment for sugar cane. Sugar cane is not exacting with regard to its soil requirements. Nevertheless, the best yields are obtained from fertile soils of volcanic, alluvial, or limestone origin. Since these soils are widespread, the major task of adjusting sugar cane production to the natural environment is not that of finding suitable soils, but rather that of discovering areas with a climate suited to the cultivation of sugar cane.

Sugar cane needs a frost-free climate and an abundance of water properly distributed throughout the year. Some varieties of cane ripen within less than a year from the date of planting, but the better and more productive ones require from 14 to 20 months to mature. Since sugar cane is injured or destroyed by frost, its cultivation is for the most part limited to those parts of the tropics where frosts never occur. Cane requires a plentiful supply of moisture—rain or irrigation water—during the growing period, and should have relatively dry weather while the crop is maturing. Too much water during the latter period results in diluting the juice, and hence in reducing the sugar content. Accordingly, the world's commercial sugar cane plantations are practically confined to lands that are frost-free, that receive 50 to 70 inches of rainfall annually, and that have one season which is relatively dry.

In regions where the dry season lasts six months, as in the Ganges Valley of India, supplemental irrigation is necessary if the crop is to yield well. In some areas, as in parts of Peru, practically all of the moisture for cane culture is provided by irrigation. Such regions, however, produce but a small percentage of the world's cane crop.

Processes of manufacture. As late as 1800, cane sugar was produced by methods that were almost as primitive as those employed centuries earlier. The presses used to squeeze the juice from the

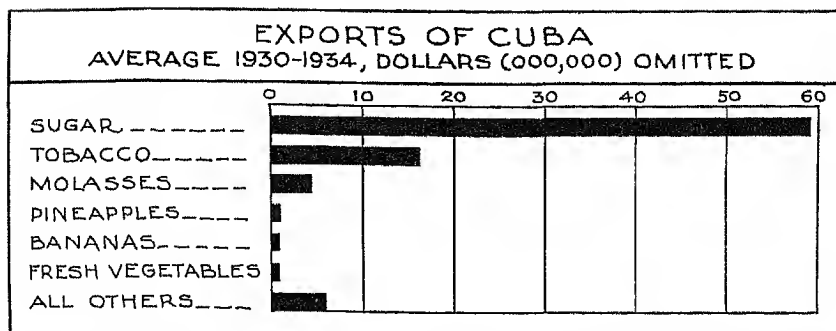


Most of the world's supply of cane sugar is produced in regions that are frost-free and that receive an abundance of rain during the summer season and light rain during the winter season

cane were small hand-fed mills, operated by horse or oxen power, or occasionally by human effort. Scientific methods of sugar manufacture were unknown and the finished product was a low-grade sugar which soon spoiled unless it was given proper care. Today, after thousands of improvements have been made in the processes of manufacture, a small amount of human effort will produce a large amount of sugar, especially after the cane once reaches the mill. Machinery now does the work formerly done by man. A carload of cane is dumped into a hopper and within a few minutes it has been fed by a mechanical conveyor into the giant crushing-mill. The juice is then run through a dozen or so vats in the process of manufacturing the raw sugar. This is a brown substance which is then sent to the refinery and is quickly changed into the high-grade product so commonly seen on almost every dining table in America.

Labor requirements. Most of the work of cane-sugar production may be done by unskilled laborers. The tasks of plowing, planting, tending, harvesting, and transporting the cane crop were formerly assigned to slaves. Even the work about the modern mill is done by the unskilled laborers, aided or directed by a few men scientifically trained.

The West Indies—an ideal sugar cane region. Except for occasional years of severe drought or of hurricanes, the West Indies possess almost ideal conditions for the production of sugar cane. These islands normally produce one-sixth to one-fifth of the total sugar output of the entire world, and in 1935 they were responsible

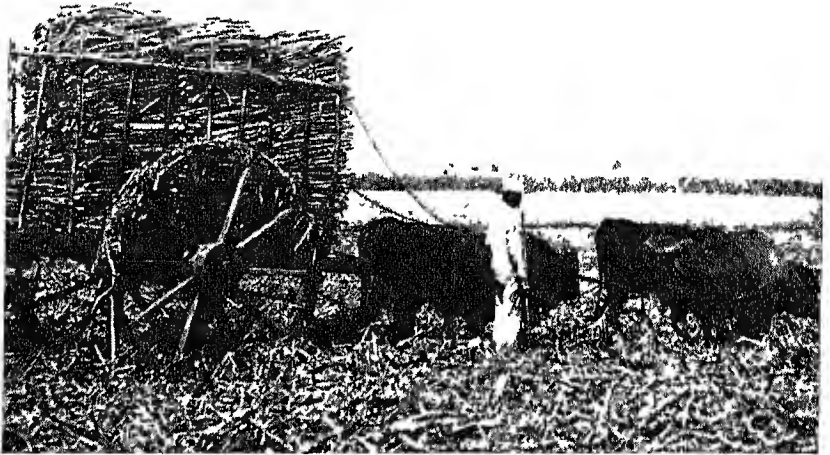


Sugar production is the major commercial industry of Cuba, and sugar is the major export. The degree of prosperity which the country experiences depends largely upon the price of sugar and the size of the crop.

for approximately 40 per cent of the cane sugar output (Chart opposite) Cuba, Puerto Rico, and Jamaica all have an abundance of fertile soil, climates well suited to the production of sugar cane, large numbers of willing laborers, and are situated close to the United States, the largest sugar market in the world. In addition, Cuba has the advantage of a preferential tariff. That is, the United States does not charge so high a tariff on sugar imported from Cuba as on that imported from Brazil, Java, or other foreign countries. The importance of tariff or duty on sugar is explained later in this chapter.

Cuba, a land of large sugar cane plantations. As a result of the advantages listed above, no other country in the world is so largely given to sugar production as is Cuba. Sugar is the major commercial product of the country (chart above), and the economic prosperity of the island is closely related to the output and price of this food. When the crop is good and the prices are high, as was the case during and immediately after the World War, the island is prosperous. During such times the Cubans import large quantities of corn meal, flour, pork, canned fruits and vegetables, and other foods from the United States. They also import large quantities of machinery for farms and factories, steel rails for sugar plantations, oil for their tractors, and a great variety of other necessities and luxuries.

When, on the other hand, prices of sugar are unduly low, or the crop of cane is poor, hard times result and the imports from the United States decrease. Similarly, the political stability of Cuba is closely related to conditions on the sugar plantations. It is a very common failing of the human race to blame hard times on the



Most of the sugar cane crop of Cuba is hauled in ox-carts to the nearest railway station. When the mud is deep, even a short haul is difficult.

political party in power, and also to credit prosperity to the party that happens to be in control at such times. Consequently, plantation troubles frequently result in political disorder and instability.

Cane sugar production requires much capital. The production of cane sugar by modern methods requires the expenditure of large amounts of capital. Practical experience has proved that large sugar mills are more economically operated than small ones. Such mills cost millions of dollars, handle thousands of tons of cane per day, and produce almost a million pounds of sugar each working day. Thousands of acres are required to supply this cane, and modern transportation facilities are needed in order that the cane may be shipped to the mill quickly and inexpensively.

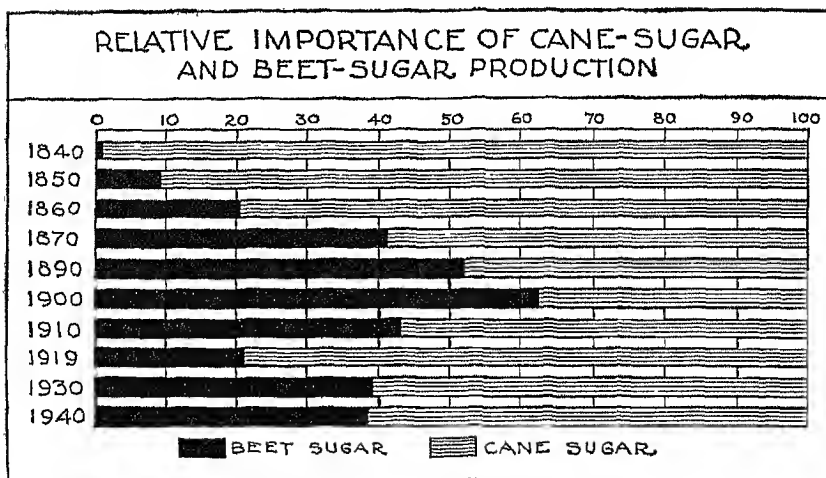
The central. The sugar cane company usually locates the mill near the center of the plantation, giving rise to the name "central." Railroads radiate from the mill to the borders of the estate, and loading derricks are built at intervals along the tracks. When the cane is harvested it is hauled in ox-carts to the nearest loading station, where it is transferred to the railroad cars, and then transported to the central. Twenty to thirty locomotives and hundreds of railway cars are used on a single plantation. In addition, 2,000 to 3,000

oxen, mules, and horses are used alongside of scores of tractors. In spite of this large-scale machinery, thousands of laborers work on the plantation throughout the year.

Sugar cane is a bulky and perishable product. In Cuba a good crop yields 20 to 25 tons per acre, whereas in the fertile volcanic soils of Hawaii and Java the yield is considerably larger. The harvested cane must be transported quickly and cheaply to the centrally located crushing-mills. These facts indicate why commercial production is limited primarily to plains where transportation facilities may be cheaply developed.

Politics and sugar production. Political factors play an important role in determining not only the kind of sugar (beet or cane) that millions of people shall eat, but also the areas in which it shall be grown. The best natural environment for the cheap production of high-grade sugar is found within the tropics. As explained in the study of Cuba, some of those areas have an abundance of inexpensive and yet fertile land, a plentiful supply of cheap labor, and climatic conditions that are almost ideal for the production of sugar cane. If it were not for government interference, there is little doubt that most of the world's sugar supply would be made from cane grown within the tropics, and from there it would be shipped to the various industrial countries of the temperate zones. However, many nations prefer to produce part or all of their own sugar, even though the cost of doing so is high. They therefore place high import duties on sugar, so as to encourage its production at home. Thus political policies have stimulated the sugar industries in regions poorly suited to them, and have retarded such developments within regions best suited to sugar cane culture. The following brief discussion explains the causes for this conflict between natural environment and political feasibility in the development of the sugar industries.

Political necessity or desirability of producing sugar at home. During the Napoleonic Wars it became obvious that if any European country were able to control the sea, she could cut off the supply of sugar from other parts of that continent. This was especially true since practically all of the European supply came from Tropical America. Napoleon saw that the danger of British supremacy on the sea threatened to stop the flow of sugar to his own vast continental domain. Consequently, he encouraged the French scientists to search for some new source of sugar that would enable the continent



Study the text to see how protective tariffs have been an important factor in the development of the beet-sugar industry.

to provide for its own needs. This move resulted in the development of the beet sugar industry.

Later, Germany foresaw the danger of being cut off from her tropical sugar supply. Consequently, she expended hundreds of millions of dollars to promote a local beet sugar industry. Other European countries and the United States soon began to encourage sugar production at home. The United States has at various times put a tariff of from one to three cents a pound on imported sugar. Largely as a result of this type of government aid in various countries, the beet sugar industry grew rapidly from 1840 to 1900, and is still important.

The World War crippled the beet sugar industry of Europe and thereby aided the cane sugar growers. But once again the beet sugar growers are increasing their output.

How tariffs aid the beet sugar industry. The way in which tariffs aid the beet-sugar industry may be illustrated by the policy of the United States. This country, like many others, favors the production of part of its sugar at home. Consequently, in order to encourage local production and also to raise revenue, a tax of two cents is placed on every pound of sugar imported from a foreign country. This tax must be paid by the importer before he is permitted to sell his product. Thus, if a foreign producer sells sugar in the United States

for five cents a pound, two cents a pound goes to the Government, leaving only three cents for the cost of production and distribution, and for profits. Since the American beet sugar companies do not pay this import tax, the entire selling price of five cents a pound goes to the producers and distributors. But for this type of government aid, it is doubtful whether the beet sugar producers either of the United States or of Europe could afford to continue operation. The removal of this tax would therefore aid the cane sugar manufacturers, and would probably ruin the beet sugar industry.

Other plantation crops of the West Indies Although sugar cane and bananas represent the most important plantation crops of Middle America, many tropical fruits, tobacco, and henequen are also grown in these tropical lands. Most of the pineapples that are imported into the United States are produced in the warm, moist coastal lowlands of this region. A large quantity of high-grade tobacco is grown in Cuba and other West Indies islands, and large supplies of winter-grown vegetables are shipped from Middle America to the United States each year.

Among the other plantation crops of special interest to the United States is that of henequen—often called sisal. Henequen is a fibrous plant from which binder twine and other types of cord are manufactured. With the invention of the binder, approximately 100 years ago, the demand for twine increased rapidly, and the United States became the leading purchaser of this product.

Until 1910, practically the entire supply of henequen fiber was grown on the limestone plain of the states of Yucatan and Campeche in Mexico, and the city of Merida became the greatest twine market in the world. Since 1910, henequen has been grown in increasing quantities in East-Central Africa, Sumatra, and the West Indies.

FUTURE OF MIDDLE AMERICA

The racial characteristics of peoples in populous countries change very slowly. As a consequence, Middle America will be represented by many races, nationalities, and tongues for a long period of time. Most cultural changes take place slowly, and, therefore, these tropical lands will remain relatively backward for at least several generations. Progress will be especially slow, since the climate of Middle America is such as to make man feel tired and lazy. Nevertheless,

economic progress is being stimulated by capable, energetic, and resourceful businessmen and scientists who have had the advantage of living in the invigorating climates of Europe and the United States

Perhaps the principal motive for this progress, initiated largely by Americans and Europeans, is the need of temperate zone peoples for tropical products. Whatever the motive, the results are beneficial for all concerned. The profitable production of bananas, sugar, pineapples, henequen, gold, silver, copper, and other commodities of Middle America has necessitated the draining of land, the building of hospitals, the control of diseases, the enforcement of peace, the development of transportation facilities, the payment of wages to millions of men, and the improvement in standards of living in scores of other ways. Thus, with economic progress come opportunities for other cultural improvements.

This progress is likely to continue at an accelerated pace. We have already seen that the bases for trade between the United States and Middle America are firm and lasting ones. The dependence of the two regions upon each other is increasing as standards of living rise and as people demand a greater variety of goods. The United States sends more and more capital, manufactured goods, and especially human talent to Middle America each year. Young, energetic men from the United States are constantly finding opportunities to go to Tropical America for fruit companies and mining companies, as salesmen and in other capacities, whereas Middle American countries are sending us increasing quantities of tropical products. These relationships can continue to best advantage only so long as there is genuine friendship among the countries concerned. Wide-awake statesmen, businessmen, and scientists, both in the United States and in Middle American countries, see the need for such friendly relations and attempt to promote them.

QUESTIONS AND EXERCISES

1. In what respects is the United States dependent upon Mexico and the Caribbean lands for its present degree of prosperity?
2. In what respects are these southern countries dependent upon the United States for their present degree of prosperity?
3. What factors favor the development of trade between the United States and its southern neighbors?
4. What geographic factors have played a part in bringing so many races

- and nationalities together within Mexico and the Caribbean Region?
- 5 What geographic and cultural factors have tended to retard the development of civilization within Mexico and the Caribbean Region?
 - 6 Write a composition on the subject How My Life Would Be Changed If I Were to Live in Costa Rica.
 - 7 How does climate influence the economic development of Mexico and the Caribbean countries?
 - 8 What part has science played in the economic development of Mexico and the Caribbean countries?
 - 9 Why are the lowlands bordering the Caribbean Sea especially suited for the development of the commercial banana industry?
 - 10 What are the major problems of the commercial banana producers?
 - 11 Why is Cuba better suited to the production of cane sugar than is the United States?
 - 12 How have political conditions influenced the sugar industries?
 - 13 Write a composition on one of the following subjects.
 - (1) Why I Should Like to Visit Mexico City
 - (2) A Visit to a Banana Plantation
 - (3) The Value of a Caribbean Cruise.
 14. What factors make for the backwardness of Caribbean peoples? (Read Smith, J Russell, *North America*, pp 662-672.)
 - 15 Discuss the culture of the Mexican peoples. (Read Rugg, Harold, *Changing Governments and Changing Cultures*, pp 589-611)

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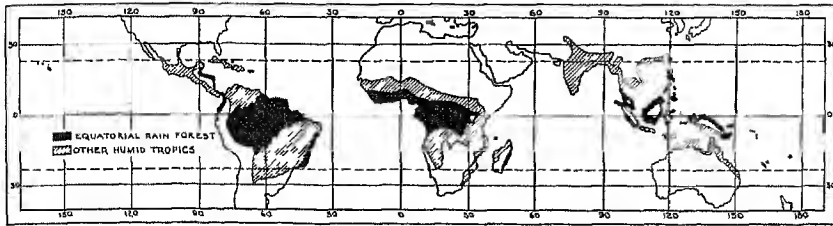
THE HUMID TROPICS--SELECTED AREAS AND INDUSTRIES

Importance. The Humid Tropics¹ occupy approximately 6,000,000 square miles—twice the area of the United States (Map opposite.) They are among the most backward portions of the earth and until a little more than a half-century ago were of relatively little importance to the commercial world. During the last few decades these conditions have been changing rapidly. Recently the great industrial nations of the North Temperate Zone have developed a tremendous demand for rubber, cacao, tropical oils, bananas, sugar, coffee, and other agricultural products that are produced exclusively or largely within the humid tropics. Consequently, much human effort and vast sums of money have been expended in order to overcome the backward conditions that exist within these hot, humid areas, and to produce those commodities which the industrial world needs. The high degree of success which has been attained is indicated by the fact that the trade of these regions is now measured in billions of dollars annually. The story of man's efforts to develop the humid tropics is one of the great romances of world history, and constitutes the subject matter of the remainder of the book.

THE EQUATORIAL RAIN FOREST

Problems of development. For thousands of years the natives of the Equatorial Rain Forest have struggled to maintain existence in an environment in which the enemies of man have been almost overwhelming. This struggle has been a long and sad one in which the primitive forest peoples have had but little chance to win. They could not see their worst enemies—disease germs—with the unaided eye, and knew of no way to combat them. In fact, prior to the time when the white man arrived in the Equatorial Rain Forest with his microscope, no one knew the nature of many tropical disease germs, and most of the natives did not even suspect that such things

¹ India is discussed in the section of the book given to Asia and will not be discussed here



For thousands of years the natives of the humid tropics have struggled to exist in a hot, moist environment where their enemies—insects and disease—have almost overwhelmed them. During the present century, scientific men have gone to the aid of these tropical peoples and, as a result, the enemies have been somewhat subdued and the humid tropics have been turned into the most promising agricultural plantation areas of the entire world.

When the populations of whole villages were all but wiped out by yellow fever, sleeping sickness, or other deadly diseases, the catastrophe was thought to be the work of evil spirits. It is not surprising, then, that thousands of years passed without the natives making any progress against these unseen and unknown foes.

Disease germs are not the only handicaps to human progress within the Equatorial Rain Forest. The hot, wet climate, the dense and rapidly growing vegetation, and the relatively infertile soils all present problems too difficult for primitive peoples to solve. For thousands of years the natives have known that these handicaps existed, but they knew of no way to overcome them. As a result, the Equatorial Rain Forest peoples have made but feeble efforts to conquer their environment. They have merely endured it. Century after century passed by, and the environment remained almost unchanged by man. Even as late as 1900, many parts of the hot, wet regions were no better suited to human needs than they had been 1,000 years earlier.

In other parts of the world, man had made notable progress in overcoming some of the most undesirable factors of environment. He had learned to heat homes in the cold regions of the world, he irrigated land in the desert, and he built terraces in some of the rugged portions of the earth. These problems, however, are relatively simple of solution. Even primitive peoples have been able to do all of these things with some degree of success. The problems of the Equatorial Rain Forest could not be so easily solved. Primitive man can scarcely be expected to learn how to cool his home efficiently. Neither can he be expected to discover methods of reducing

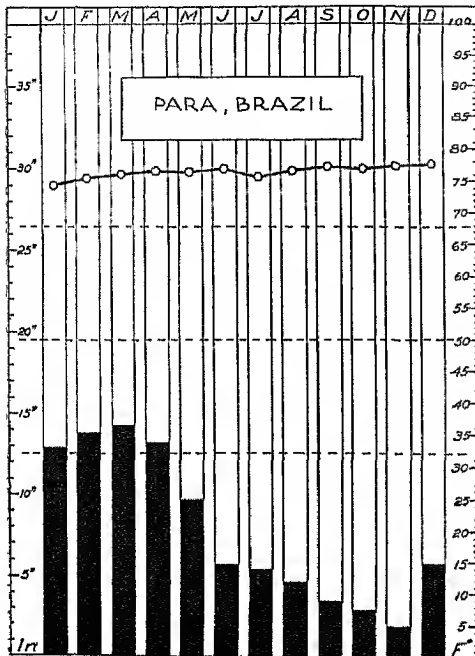
the relative humidity of the atmosphere. These are accomplishments that are only recently being achieved by the most highly cultured peoples. Yet high temperatures and a moist atmosphere are two of the worst enemies to progress within these tropical regions.

Further study of this chapter will bring out the fact that the environment of these wet, tropical lands is such that it cannot be conquered by primitive peoples. Consequently, human progress within these areas is all but impossible except as men, scientifically trained in other parts of the world, lend aid to the natives. It is the purpose of this chapter to indicate the relationship which exists between the natural environment and the economic conditions within the Equatorial Rain Forest. This sad story tells why primitive peoples have been dominated by their environment rather than the environment by them. It shows how environmental factors have contributed to the inefficiency of equatorial peoples and to the backward

state of their culture.

In a later chapter we shall learn that a few decades ago European peoples began one of the most daring and dangerous undertakings of all historic times—the conquest of the humid tropics and especially of the Equatorial Rain Forest. The story of this conquest makes a fascinating chapter of history, and the results of the conquest have brought great and, we believe, lasting benefits to mankind.

Adverse climate. As already pointed out, climate, either directly or indirectly, is largely responsible for many of the ills that trouble the peoples of the lowlands of the East Indies, and of the Amazon



At Para, Brazil, it is difficult to distinguish winter from summer by the temperature conditions. The year is divided—by the amount of precipitation—into wet and less-wet seasons.

and the Congo valleys. These regions lie near the Equator, where the sun's rays are most nearly vertical (Illus, p 639.) Consequently, the temperatures are high the year round, and seasonal changes are slight. Moreover, the rainfall is heavy (60 to 100 inches a year), with no dry season or only a short one, and the relative humidity is high most of the time.

Climate and vegetation The constantly high temperatures and heavy rainfall favor the continuous growth of dense forests of broad-leaf evergreen trees. Perpetual shade is the result, with huge trees constantly spreading a dense canopy of leaves overhead. Beneath this covering is an almost impenetrable growth of small trees and shrubs, many of which are adapted to the shade. The whole mass may be so woven together with vines as to make travel through the forest impossible without first cutting a path or a trail. The photograph below shows the dense forests of the humid tropics.

Climate and disease. The combination of high temperatures, moist atmosphere, stagnant water, and dense shade results in a dreadful



Travel through the tropical jungle is difficult, and road-building is both difficult and expensive

drain on human energy. It makes a paradise, however, for man's worst enemies—insects and disease germs. The Equatorial Rain Forest is almost ideal for the multiplication and spread of flies, mosquitos, ants, termites, disease germs, and fungus (plant) diseases. These enemies of the human race never rest. They fight against man and prey upon his possessions with never a truce. Whole villages have been wiped out by their persistent ravages, but other peoples have come in to take up the struggle anew. Prior to the time when scientists took up the fight against the insect pests and disease germs, the results were always the same—man lost and diseases won. No matter how sturdy the newcomers were when they entered the forest, they were soon subdued, both in spirit and in body, by diseases and a debilitating climate. The insects, spreading a score or more of deadly germs, were fighting with weapons that these primitive peoples did not understand.

No effective methods of fighting yellow fever, sleeping sickness, hookworm, and many other diseases have ever been discovered by the natives. Nature built up in man a certain degree of immunity against some of these diseases, but this immunity was never complete. When the white man began to exploit the Equatorial Rain Forest, he attacked these insects and disease germs with vigor. Science was the major weapon used in the attack. Some of the results of the struggle are discussed briefly in later chapters. It is sufficient to state here that scientists are slowly but surely winning the fight.

Climate and efficiency No scientist doubts that there is a close relationship between the climate of the Equatorial Rain Forest and the inefficiency of its people. It is difficult, however, to determine how much of this inefficiency is directly the result of climate, and how much to diet, diseases, hygiene, sanitation, and other factors which are only indirectly related to climate.

Man has no power to change the climate of his homeland, but he is able to mitigate some of its adverse effects. In so far as the inefficiency is directly the result of climate, the only solution seems to be the control of temperatures and humidity within the houses. Cool houses would insure comfort while the people are inside. At the same time, the constant change of temperatures resulting from staying part of the time within the house and part of the time outside would accomplish much the same beneficial effects as changes in

weather. Only a few experiments with the cooling of houses have been undertaken within the tropics; yet enough has been done to show something of the tremendous possibilities along this line

Perhaps the inefficiency of tropical peoples is more a result of the indirect, rather than the direct, influences of climate. It has already been pointed out that the myriads of insect pests, disease germs, and fungus growths are closely related to climate. The rapid and continuous growth of weeds and undesirable vegetation, which choke crops unless they are cultivated, is also related to climate. In addition, the relatively infertile soils of the Equatorial Rain Forest are largely attributed to the continuously high temperatures and to the abundance of rainfall.

Poor quality of soils. The infertility of Rain Forest soils is largely a result of heavy rainfall and high temperatures. Most plant foods, such as lime, potash, phosphate, nitrate, and manganese, are soluble. The heavy rainfall keeps the soil well filled with percolating water. This water is constantly dissolving—*leaching*—the mineral fertilizers from the soil and carrying them away in solution. During the rainy season much of the water flows off the surface into the many streams. This run-off wears away—*erodes*—the soil, and carries large quantities of it in suspension to the sea.

Such rivers as the Amazon and Congo carry millions of tons of dissolved and suspended fertilizers to the sea annually. The Amazon river carries such large quantities of soil that the water discharged at the mouth of the river appears muddy for a distance of several hundred miles out into the Atlantic Ocean.

Not only are the soils of the Rain Forest poor in mineral foods, but they are also poor in humus—vegetable matter. As a result of the high temperatures and abundant moisture all vegetable matter disintegrates and decomposes—*decays*—rapidly. These processes are hastened by worms which eat the vegetation and disgorge it in a pulverized state suited to rapid decay.

These processes of *leaching*, *erosion*, and *decay* are going on year after year and century after century. They are three of the worst robbers of the tropics. They compete for first place in this respect with the hot, wet climate which so quietly and stealthily saps the energies of man.

The depletion of fertilizers takes place to a depth of many feet. The top soils are the ones most seriously affected. The sub-soils—

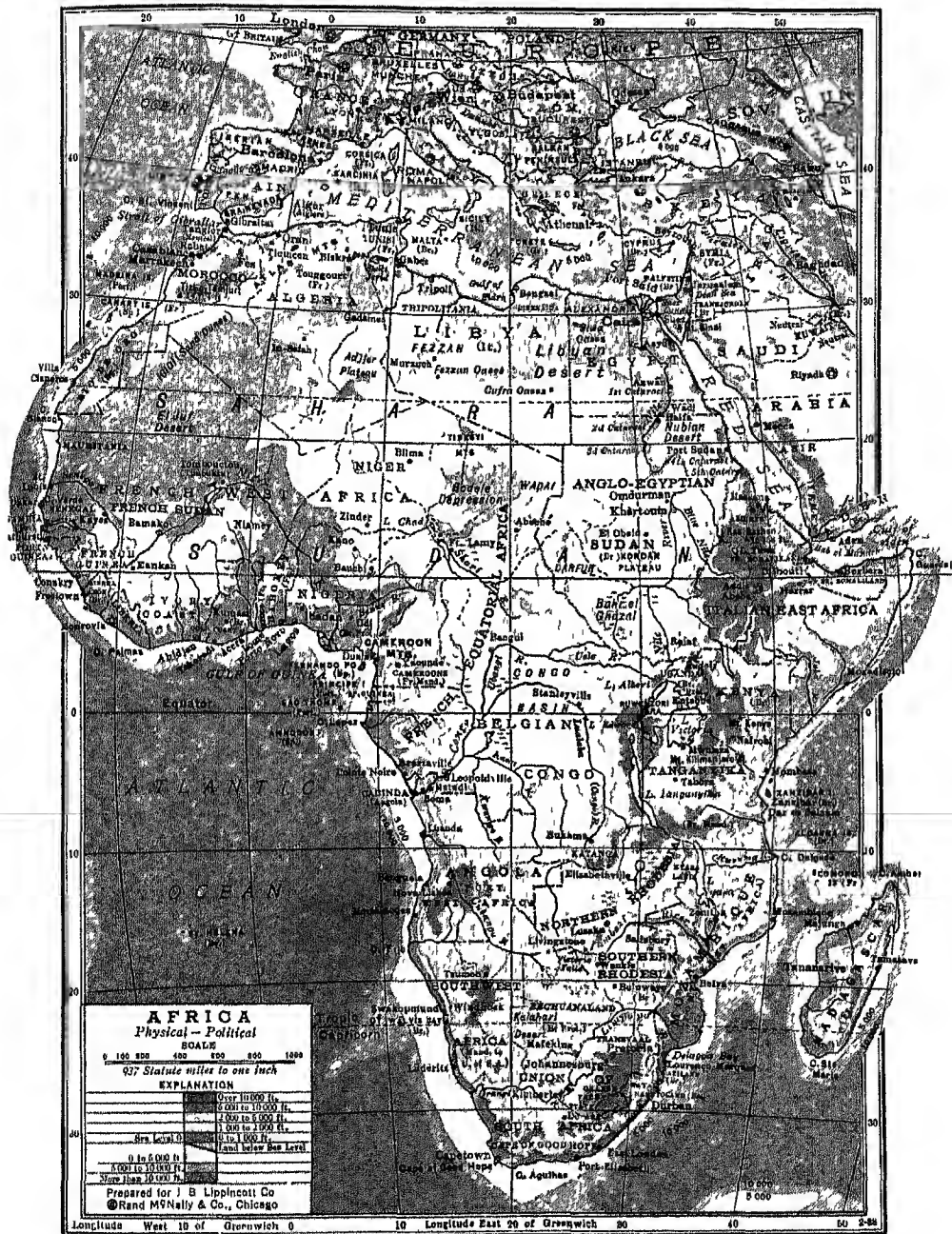
those beneath the surface—are protected from erosion and to a certain extent from leaching. They retain, therefore, a greater percentage of their mineral fertilizers.

Limited areas of fertile soil. Although most of the soils of the Rain Forest are infertile, there are a few notable exceptions. Most of these exceptions are within the East Indies and are the result of recent volcanic activity. Java affords the best example of the influence of fertile, volcanic soils. This island is largely covered with volcanic ash or alluvial soils made from this ash. This volcanic material has but recently been ejected from the depth of the earth, where it was far removed from the influences of the soil-robbing processes previously mentioned. This soil is therefore exceedingly fertile. Farmers can produce large yields on the same land decade after decade.

Food products scarce. The primeval forests of equatorial regions are exceedingly poor in food for man. A few species of trees bear nuts suitable for food, some starchy roots, native to the forest, are edible; fish, usually poor in quality, may be caught in the streams; and meat, always a luxury in the Equatorial Rain Forest, may be obtained by killing the monkey, the peccary, or other small animals. Wherever relatively dense populations are supported within these regions the peoples have turned to agriculture and do not depend wholly upon the products of the forest for their food supply.

Backward peoples. The major factors which determine the degree of well-being of any people are: (1) The energies and capabilities of the peoples themselves; and (2) the nature and supply of the resources with which their lands are endowed. We have already learned that the climate of the Rain Forest is so debilitating that the natives feel tired most of the time. They have so little energy that millions of them take every possible opportunity to rest. This deficiency of human energy is a tremendous handicap to progress. It is a sufficient cause in itself to account for much of the backward state of native culture. No matter how great the resources of a region may be, an inefficient, debilitated, and uneducated people cannot use them to advantage. This inability of the natives to utilize their resources to advantage makes for a meager productive capacity which, in turn, results in poverty.

Low standards of living. The standard of living of all peoples is closely related to their productive capacity. This productive capacity, in turn, is dependent upon knowledge, energy, and natural



resources. A people deficient in any one of these three things is handicapped in its struggle for economic well-being. The North American Indian had the natural resources and perhaps the energy for the building of an industrial nation, but he lacked the knowledge. The Negroes of the Congo Valley have vast resources, but they lack both the knowledge and the energy for great achievement. They possess vast water-power resources but produce no hydroelectric power, they have forests of huge trees for lumber, clay for bricks, and stone for cement, but they live in houses scarcely worth the name. In fact, millions of tropical natives possess but little more than the bare necessities of life—food, which too often is of poor quality; clothing, of which they require but little in their warm homelands; houses, which are for the most part merely shelter against the rain.

The necessities for a mere existence are few. It is difficult for the average American high school student, accustomed as he is to the many comforts and luxuries of life, to understand how little is really necessary for existence. Millions of tropical peoples have never seen an automobile, an electric light, a bath tub, or a screen door. They have never talked over a telephone, attended a moving picture theater, or walked on concrete, asphalt, or stone sidewalks. They have never heard music from a radio or piano. They have never slept on a bed with spring coils or sat in an overstuffed chair. This list of products which millions of natives do without might be extended indefinitely. However, enough examples have been given to illustrate the poverty of these peoples with regard to those conveniences which are considered necessary to the well-being of the average American citizen. Not only are their requirements few, but, in addition, they seem content to get along without the comforts, conveniences, and luxuries to which civilization is accustomed.

INTERNATIONAL TRADE OF EQUATORIAL RAIN FORESTS

Standards of living and international trade. High standards of living necessitate extensive international trade; whereas low standards of living retard trade. Those countries having the highest standards of living are the ones that demand the greatest variety of products. Many of these products must be imported. Even a country as rich in resources as the United States is no exception in this re-

spect. Scarcely a day passes that the average high school student does not use scores of resources that have originated in foreign lands. (See pp 97, 98, and 289) Perhaps no other single factor has done more to raise the standards of living in tropical areas than has the development of trade. Conversely, the increasing standards of living promote trade

Educating for trade If the people of Central Africa and of the Amazon Forest had a strong desire for telephones, bath tubs, medicine, and tooth brushes, they would be willing to put forth effort to produce something that could be exchanged for these commodities. Under such conditions the development of trade would be limited only by the capacities of the people to produce marketable products from the resources available. If, however, these peoples have a stronger desire for an easy life than for conveniences, trade will be difficult to develop. The task of educating backward peoples to work for the luxuries and comforts of life requires time and patience

Poor transportation facilities. The great bulk of the trade of the Equatorial Rain Forest is carried on by natives who live close to the sea or along navigable rivers. This distribution is largely a result of the fact that in most other parts of the tropics transportation facilities are poor; the movement of goods is slow, and the costs of transportation are high. In fact, even the river trade in most parts of the wet tropics is slow and expensive. Waterfalls, rapids, shifting sand bars, floods, and inefficient laborers, all tend to retard river transportation.

Railroads and highways expensive. The development of railroads and highways in the Rain Forest is costly in money, labor, and human life. The vegetation is almost overwhelming. In many places one cannot even walk through the forest without first cutting a trail. This task is an easy one, compared with that of building a highway or railroad. The work of merely clearing the tangled vegetation from the land and the grading for a roadbed are both tasks that require a tremendous amount of effort. Even if these were the most difficult problems of the road-builders, they would be sufficient to retard development.

This struggle against the forest, difficult as it is, constitutes but a minor problem for those who would build and operate a railroad within the Rain Forest. The task of coping with insect pests and disease germs presents difficulties of far more serious proportions. During the early days of development within the Rain Forest, it was

not uncommon for more than half of the laborers to be sick continuously. Occasionally more than three-fourths of the laborers were incapacitated by disease, and the death rate was always alarmingly high. It has been estimated that the railroad which extends around the Madeira-Marmora Falls, Upper Amazon Valley, cost a human life for every crosstie laid in the road bed.

It is not surprising, then, that relatively few miles of railway have been constructed within the Rain Forest. Very few of the natives of the Amazon Valley, a region larger than the United States, have ever seen a tram. Only two railroads, each less than 100 miles in length, have ever been constructed in that vast forest. These two roads are nearly 3,000 miles apart. One of them, the Madeira-Marmora railway has been a constant economic burden to Brazil. The other, a short line extending inland from Para has not been very profitable. Similarly, railroad building has been expensive in the vast tropical forest of the Congo Basin and only a few hundred miles have been constructed. The mileage of highways is correspondingly small.

Trade with interior is expensive. Handicapped by a lack of modern and efficient transportation facilities, trade with the interior of large Equatorial Rain forests is expensive. This fact explains why most of the trade of these regions develops near the coast or along navigable streams. There are instances where native farmers carry loads of cacao beans, palm kernels, palm kernel oil, or other commercial products a distance of four or five days' journey to market, not including the time necessary for the trip back home after the product has been delivered. To this work must be added that which is necessary to grow, harvest, and cure the crop. Then the entire cargo may be sold for less than one dollar. This is a tremendous amount of human effort to expend for such a small sum of money. Unless the native is exceedingly anxious to secure something that such money will buy, he will not continue to struggle to obtain it.

SUBSISTENCE AGRICULTURE

Importance. If the subsistence agriculture of the Rain Forest is measured in terms of its value to the natives, it is found to be the most important industry of all of these regions. Tens of millions of natives, occupying millions of square miles of land, give more than 75 per cent of their productive effort to this one industry. If, on the

other hand, the subsistence agriculture is measured in terms of its value to the industrial countries of the world, it is found to be of but little importance. One hundred square miles of commercial plantations in Malaya, occupied by only a few thousand natives and foreigners, may produce goods worth millions of dollars to industrial countries, whereas, a million square miles of forest, situated in the upper Amazon or Congo valleys, and occupied by subsistence farmers, may produce very little that is of value to the outside world.

Distribution. There are no sharp dividing lines, either in the Equatorial Rain forests or in other agricultural regions, between the areas of subsistence farming and those of commercial agriculture. There is usually some subsistence farming within the areas where commercial farming is most highly developed. Likewise, there is usually a little commercial production in regions given largely to subsistence agriculture. Nevertheless, the type of agriculture developed within a region usually bears a close relation to the nature of the local transportation facilities. Isolated regions—those that have poor transportation facilities—are handicapped in their attempts to sell surplus farm products and also in their efforts to import commodities which they do not produce. These difficulties make it necessary for farmers of isolated regions to turn to subsistence agriculture. That is, they produce practically everything they consume, and in turn find there is little or nothing to be gained by producing a surplus. On the other hand, farmers situated close to good transportation facilities may find it to their advantage to give their efforts to commercial agriculture. They may produce a surplus of those crops well suited to their land but poorly suited to other regions. This surplus is sold, and with the proceeds they buy any commodities which they need but do not produce.

Credit due natives of Equatorial Rain Forest. Such terms as lazy, indolent, inefficient, and backward have too frequently been applied to the natives of the Equatorial Rain Forest, without explaining the causes for these conditions. When all of the facts are understood, it becomes evident that the natives deserve much credit for the progress that they have been able to make. They have been handicapped by adverse climates, deadly diseases, improper foods, infertile soils, dense and rapidly growing vegetation, and poor transportation facilities. Such disadvantages of the natural environment, unless they are overcome by science, subdue the white man as well as the native. Fortunately, science is at last coming to the rescue

of both the native and the white man. The part that science is playing in the conquest of the tropics is discussed in later chapters of this text.

QUESTIONS AND EXERCISES

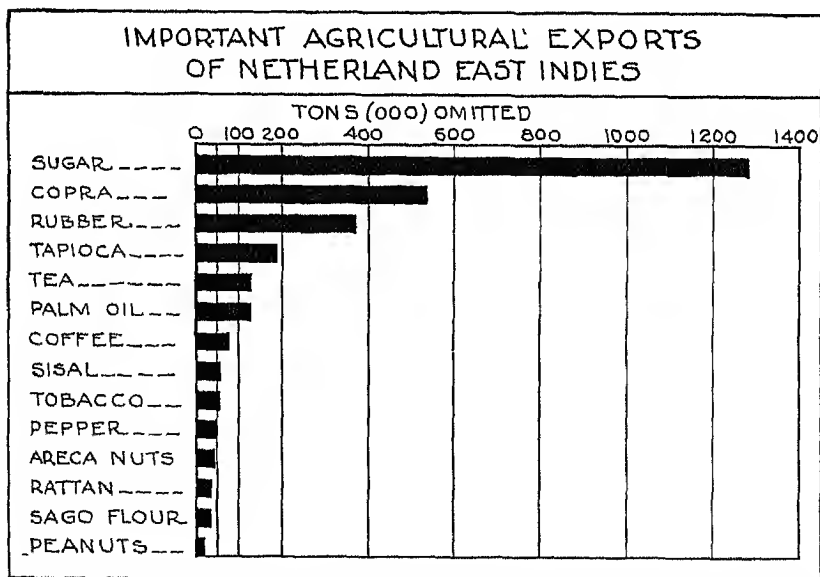
1. How do environmental factors retard human progress within the humid tropics?
2. What are the direct influences of the humid tropical climate on man?
3. How does the humid tropical climate affect man indirectly?
4. What are the major problems of development as indicated in illustration on page 641?
5. Why is there but little fertile soil within the wet portions of the tropics?
6. What are the basic factors that have resulted in the development of a large trade between the United States and the wet tropics?
7. Do you think the wet tropics will ever become a good home for white peoples? Give reasons for your answer.
8. Is the trade of the temperate zones with the tropical zone likely to become larger or smaller? Explain
9. Do you think the Negro tribes of the Central Congo Valley deserve as much credit for the little progress that they have made as we deserve for the great progress we have made?
10. What resources are used in cooling homes? Does the Congo Basin have this resource?
11. Do you think the homes of the tropics may some day be artificially cooled?
12. What effect would artificial cooling of houses have upon the civilization of the tropics?

FURTHER READINGS

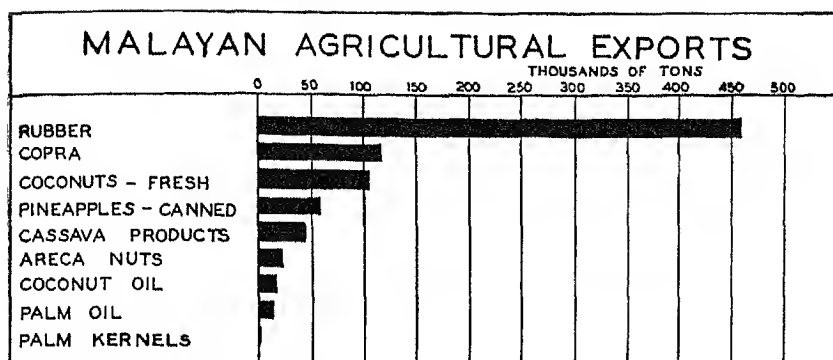
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COMMERCIAL AGRICULTURE OF THE HUMID TROPICS

Early handicaps overcome. As pointed out in the preceding chapter, the early development of the humid tropics was retarded by many unfavorable geographic conditions. Throughout these areas progress was slow because of the debilitating climates, diseases, and backward stages of civilization. In addition, large areas were handicapped because of relatively infertile soil, dense vegetation, isolation, or other unsatisfactory conditions. The problems presented by these handicaps have been partly overcome, as is indicated by the fact that the humid tropics have become the most important plantation agricultural areas of the world. Their annual exports are now measured in millions of tons and valued in billions of dollars.



The Netherlands East Indies, with their exceedingly dense population—500 to 1,000 people to the square mile over large areas—produce enough food for home use and, in addition, large quantities for export.



Although rubber is the outstanding export of Malaya, the peninsula is also an important exporter of food products

Diverse agricultural exports. Although the humid lands of low latitudes are especially noted for their export of rubber, cacao, sugar, coffee, coconut products, palm oil and palm kernel oil, and tapioca, many other agricultural products of lesser value to the world are also exported. The Netherland (Dutch) East Indies alone have produced a surplus of almost a score of foods and industrial crops. Their exports in prosperous years have approximated 6,000,000 tons valued at more than \$66,000,000. (Chart opposite.) The agricultural exports of Malaya have exceeded 1,000,000 tons, as shown by the chart above, and have been valued at more than \$500,000,000. Similarly the Philippine Islands, equatorial West Africa, and the West Indies have produced large quantities of varied agricultural products for export.

United States trade with the humid tropics on firm foundation. The United States ranks first among all of the countries in the world in its trade with the humid tropics. Our imports of sugar, rubber, oils, coffee, cacao, and bananas represent a large percentage of our foreign trade. (Illus., p 290) Moreover, during the last few decades our trade with the humid tropics has been growing rapidly. Since this trade is based largely upon differences in climate and in stages of civilization—conditions which change slowly or not at all—it is likely to continue to grow. Our desires for tropical products are likely to increase rather than diminish, and as the standards of living are raised within the tropics, these peoples are likely to demand increasing quantities of factory-made goods from the United States and other temperate zone countries.

RUBBER INDUSTRIES

Importance of rubber industries. Few other industries have experienced such rapid growth as those of rubber production and manufacture. The production has given rise within a few decades to one of the most important commercial agricultural industries of the entire tropics. Large tracts of land that formerly were almost impenetrable jungles have been transformed into well-ordered plantations which now produce nearly a million tons of rubber annually. This rubber is shipped to the great industrial nations of the world, where its fabrication into thousands of useful products has created manufacturing industries with an invested capital of more than \$1,000,000,000 and an annual output valued at \$1,500,000,000 to \$2,000,000,000 a year. (The annual value of rubber products manufactured in the United States alone exceeds \$1,250,000,000 in times of prosperity.)

The importance of rubber production to tropical peoples. The importance of rubber production cannot be measured in terms of the sizes of the plantations, the dollars invested in the industry, or the value received from the output of the factories. The true value of the rubber industries is determined by the far-reaching influences they have had on the economic, social, and political well-being of hundreds of millions of people. These results have been for the most part beneficial. For millions of tropical peoples the development of the rubber plantations has brought with it improved housing facilities, better sanitary conditions, a more wholesome social atmosphere, a greater variety of nutritious foods, a few of the luxuries of the industrial world, and in other ways has raised the standards of living. However, as will be explained later in this chapter, the development of the rubber-growing industry has been associated at times with much suffering. Thousands of backward and uneducated rubber-gatherers who have worked in the hot, moist, gloomy tropical forests have been compelled to suffer untold hardships.

The importance of rubber products to temperate zone peoples. In a commercial world such as ours, the economic activities of a people in one area may be the basis for revolutionizing human activities in distant lands. Such results have been brought about by the production and use of rubber. Just as rubber cultivation has induced major changes in the living conditions of millions of backward tropical natives, so the manufacture and use of rubber has

resulted in even greater changes in the social structure of the industrial nations of western Europe and of America. Only a few million tropical peoples have been affected materially, either directly or indirectly, by the *growing* of rubber, whereas hundreds of millions of temperate zone peoples have felt the beneficial effects of its *use* in one way or another.

Uses of rubber. The major use of rubber is for the manufacture of tires for more than 50,000,000 automobiles which are now being operated in every country of the world. Other uses, however, are by no means insignificant. Rubber is of inestimable value for the manufacture of overshoes and overcoats, which help to protect the health of millions of people; rubber gloves have become almost indispensable in modern surgery, and are part of the equipment of every modern hospital in the world today. In thousands of other ways rubber has added to the comfort, pleasure, health, and wealth of peoples in all parts of the world, but especially in the temperate zones.

The rise of the rubber industries. The natives of Brazil had already learned how to make rubber from the latex of the hevea tree before Columbus discovered America. When the Europeans first arrived in America they found the Indian children playing with crude rubber balls, much as the American children do today. The early explorers took rubber back to Europe, where it was soon discovered to be useful in erasing pencil marks and, as a result, was called rubber. This use created but little immediate demand for the product, since at that time few people knew how to write. The discovery occurred before the day of widespread education, and therefore at a time when most people could not even write their names. Consequently, a few thousand erasers constituted the world's major demand for rubber. Today erasers are needed by hundreds of millions of people, and thousands of tons of rubber are used annually to satisfy this demand alone.

In 1823, Macintosh, a Glasgow merchant, patented a method for using rubber in the manufacture of raincoats and overshoes. In 1842, Goodyear discovered the process of vulcanizing rubber, thereby making a more durable product for water-proofing cloth than the one discovered by Macintosh nineteen years earlier. It was the demand for these products within the industrial countries of Europe and America that created the first important commercial production of rubber. After the middle of last century new uses for rubber

were discovered in rapid succession. As a result, literally thousands of rubber products are now manufactured, requiring more than 750,000 tons of rubber annually.

Gathering wild rubber is laborious. Until the beginning of the present century, practically all of the world's supply of rubber was obtained from the hevea tree, which is native to more than 2,000,000 square miles of the Amazon Valley. These trees do not grow in groves, but are widely scattered throughout the forest. Such distribution increases the labor necessary to gather the latex from which the rubber is made. The first task of the rubber-gatherer is to locate a large number of trees, preferably 200 or more, and then to clear a path through the dense forest connecting all of these trees. He then cuts gashes in each tree and arranges small cups so as to catch the latex. (Picture below.) These tasks completed, the rubber-gatherer is ready to begin his daily round from tree to tree. He is required to walk many miles in order to get a small bucket full of



The task of gathering rubber in this typical well-kept plantation is a simple one compared with that of gathering wild rubber from trees widely scattered throughout the jungle.

latex, and it may take him more than a month to gather enough of this milky flow to make a rubber ham (a ball of rubber) which weighs about 100 pounds.

Living conditions of the rubber-gatherer unpleasant. The task of the wild-rubber-gatherer is a hard one and living conditions are unpleasant. Most of the native rubber trees grow in regions that are low and swampy the year round. Part of the time the lowlands are covered with water several feet deep, and the streams are swollen to such an extent that they are difficult to cross. During these periods of flood the laborer frequently is compelled to stop work.

Sanitation and health Even more serious than the floods is the danger of sickness. The native rubber-gatherer works in one of the most unhealthful and debilitating regions of the world. The poorly drained land affords excellent breeding places for mosquitoes that spread malaria and yellow fever, the impure drinking water frequently results in dysentery and other intestinal disorders; and the hot, humid, unwholesome climate favors the multiplication of disease germs which cause festering sores. Thus the natives are frequently sick. Even when the laborer is not diseased he seldom feels like work. The high temperature and high humidity, together with the monotony of the climate, cause the natives to feel listless and tired. Such people may be free of disease, but the organs of their bodies do not function properly. We commonly call such people lazy. For many of them the greatest luxury of life is "rest."

Care of the sick. The sick laborer cannot call in a good doctor, for the closest one may be scores to hundreds of miles away. Neither can he be sent to a hospital, for the nearest one may be more than a thousand miles away. Thus the sick may be compelled to lie day after day in homemade hammocks or perhaps just on the damp ground of a thatch-covered hut. (Illus., p 656.) If the sick person is given care at all, it is in most cases that of a witch doctor, whose treatment is as likely to injure as to aid the patient. It is not surprising, then, that the death rate is high and that few of the rubber-gatherers live to be more than 40 years old.

Labor supply and the price of rubber As a result of the conditions just described, it is not surprising that the Indian laborer, when permitted to do as he pleases, works only a few hours each day and but a few days each month. This desultory method of gathering rubber was satisfactory so long as a few thousand tons of the product were sufficient to supply the world's needs. Such a method of work

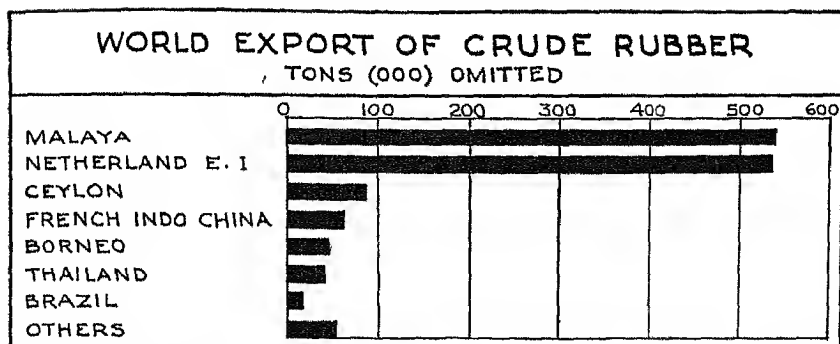


The thatch-covered hut of the rubber gatherer may be situated hundreds of miles from the nearest hospital, scores—or even hundreds—of miles from a good physician, and miles from the nearest neighbors. (Courtesy Ford Motor Company.)

harmonized well with the Indian's temperament and at the same time produced enough rubber to supply the trader's needs. When, however, the growth of the automobile industry caused a rapid increase in the use of rubber, this slow, spasmodic method of gathering it no longer produced enough to satisfy the demand. Consequently, the price of rubber increased from 50 cents a pound in 1900 to 75 cents in 1905, and finally to more than \$1.00 a pound in 1911 and 1912.

PLANTATION RUBBER

Environment and plantation rubber. It is only natural that, once the American and European peoples began to experience difficulty in obtaining rubber from the native forests of Brazil, they should attempt to produce it in plantations where the most favorable conditions for its growth could be selected, and maintained. The task of determining the best climatic, soil, and topographic conditions for rubber plantations was approached by two methods: first, by a study of the conditions where the trees grew wild; and second, by experi-



Practically all of the world's supply of crude rubber is grown in the Middle East Data for 1940.

mentation—that is, by planting trees in many areas and under a great variety of conditions in order to see where they are most productive. By such methods it has been discovered that the best climatic conditions are represented by relatively uniform temperatures averaging about 75° F., and by a rainfall of 60 inches or more, fairly well distributed throughout the year. Moreover, in order that the trees may yield a large supply of high-quality latex, the soil must be fertile and the land well drained.

In the selection of a proper location for rubber production, the human environment is as important as the physical. Economic production makes it necessary that the plantations be located in or near densely populated areas that afford a large labor supply; and economic marketing requires that the plantations be situated close to important routes of world trade. When all of the aforesaid factors are considered it is found that the Middle East (southeastern Asia and the East Indies) is best suited for the development of rubber plantations. Consequently, more than 95 per cent of the world's rubber is now produced in this region.

The development of rubber plantations. After a planter has decided on a suitable place for the development of a rubber plantation, his next task is to make provisions for laborers who are to do the work necessary to such an undertaking. Homes must be built, and conditions surrounding the homes must be made as sanitary as possible, so that the laborers will remain well and feel like working. (Illus., p. 658) Next comes the difficult task of clearing the dense tropical jungle, draining any portion of the land that is swampy, and planting the seedlings which have already been grown in a



On the modern rubber plantation the home conditions are made comfortable and sanitary. Close woven screens are put up at all doors in order to keep out insect pests, and the buildings are well-lighted and airy. (Courtesy Ford Motor Company.)

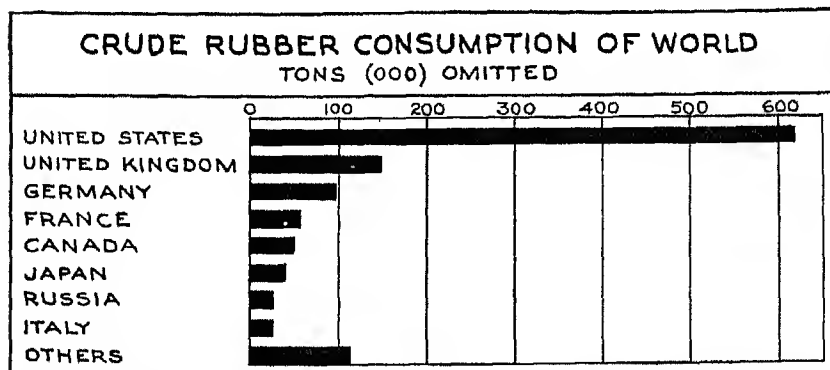


A rubber-tree nursery. The ground has been cleared, drained, and the nursery started. The jungle in the background looks rather forbidding. Millions of acres of jungle similar to this one have been cleared in order to make room for rubber plantations.

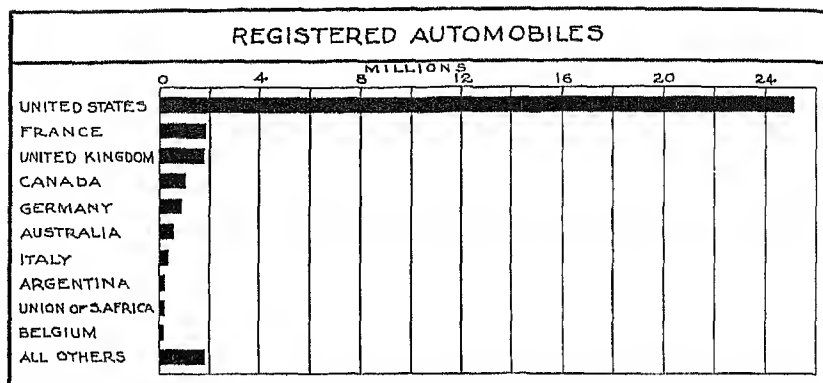
nursery (Illus, p. 658) After these seedlings have grown for a year or so in their new home in the plantation, the trees are cut off about a foot above the ground and a branch of a good rubber-producing tree is grafted in each stump This process is called budding. It insures that a first-class latex producer, like the parent tree from which the branches for budding were taken, will grow on the stump of the seedling. In this respect the plantation trees are superior to the native trees Many of the latter grow from seeds whose parent trees are poor latex producers

The rubber manufacturing industries. Practically the entire world's output of rubber now finds its way to the industrial countries that are commercially tributary to the North Atlantic The major exception is Japan. (Chart below) Backward peoples, such as the Chinese and the natives of India and of most of the tropical countries, utilize but little rubber. The reason is clear They own few automobiles and therefore need few rubber tires They cannot afford to protect their health by the use of rubber overcoats and shoes The peoples of most of these countries purchase such small quantities of rubber goods that it does not pay to manufacture them locally Such rubber goods as they require are imported from the various industrial nations

Most of the rubber manufacturing centers are located in eastern United States, western Europe and Japan A study of the major uses of rubber indicate the causes of this concentration The great



Practically all of the rubber output of the world is consumed within the countries bordering the North Atlantic Ocean Japan is the most notable exception. Data for 1940 for the United States, the United Kingdom, and Canada. Data for 1938 for other countries.



This chart shows in a striking manner why the United States uses most of the world's rubber output. Figures for 1935.

bulk of the rubber now goes into the manufacture of tires for automobiles, most of which are operated in countries bordering the North Atlantic. (Chart above.) Next to rubber tires the most valuable rubber products are boots, overshoes, and waterproof coats. Here again, inclement weather and high standards of health result in a large demand for these goods in countries bordering the North Atlantic. Many of the other rubber products, such as rubber hose, belting, insulating materials for electric wires, and telephone instruments, are associated with industrial development and are consequently in greatest demand within the great industrial areas.

Akron, the rubber manufacturing city. One of the most amazing examples of industrial concentration is represented by Akron, Ohio. This city of slightly more than 250,000 population produces approximately \$500,000,000 worth of rubber goods annually. Nearly one-third of the rubber output of the world finds its way to this city, and its products are well-known in every country. Its factories can turn out more than 50,000 tires a day and can supply a large part of the needs of this great nation. Akron is centrally located in the heart of eastern North America, the greatest rubber-consuming area of the world. However, its chief advantage over other cities centrally located is that of an early start under a capable leader.

Dr B. F. Goodrich established a factory in Akron in 1871 to make rubber goods by a new process which he had discovered. New industries tend to locate in a place where there is supply both of skilled and unskilled labor. Consequently, when other men wished to

establish rubber manufacturing industries they were attracted to Akron, where skilled labor could be obtained. When the automobile came into general use, the demand for tires grew rapidly, and Akron's population increased from 69,000 in 1910 to 255,000 in 1930. This city is supported almost exclusively by the rubber industry, and one company now produces more than 30,000 different rubber articles. While Akron has retained the lion's share of the rubber industries, some of them have naturally migrated to other centers. Thus the great shoe-manufacturing centers have been able to attract to themselves a large part of the rubber-boot, rubber-overshoe, and rubber-sole industry. These later industries largely account for the large rubber-manufacturing industries of the east coast and middle western states.

Outlook for rubber production. There is no danger of any protracted rubber shortage. Prices may be held unreasonably high for a time, but cannot be held so indefinitely. There are millions of square miles of land suited to rubber production. Any attempt by the British and Dutch to restrict rubber production so as to boost the price unduly high is likely to stimulate interest in (1) the production of synthetic rubber, (2) the increased use of second-hand rubber, and (3) the development of new plantations in Brazil, Central Africa, and other tropical lands that are not under British or Dutch control. Already substitutes for rubber are being produced in the factories of the United States. One substitute, *Du Prene*, has been proved to be superior to natural rubber in some respects. It is, however, still expensive. It is not unlikely that within the relatively near future synthetic rubber may replace the natural product in the manufacture of much if not all rubber goods.

QUESTIONS AND EXERCISES

1. What handicaps of the tropics are being overcome?
2. What handicaps of the tropics are most difficult to overcome?
3. How do the rubber industries help tropical peoples?
4. How do the rubber industries help temperate zone peoples?
5. Is rubber more valuable to tropical peoples or to temperate zone peoples? Explain.
6. Why is a large part of the world's rubber marketed through England and Holland?

- 7 Write a 400-word composition on one of the following subjects.
 - (a) The Advantages of Malaya over Brazil for Rubber Production
 - (b) The Hardships of Wild-Rubber Production
- 8 Do any of the charts or figures of this chapter indicate why the East Indies are considered very valuable colonies? Explain
- 9 What countries would be hurt most if large quantities of high-grade synthetic rubber could be manufactured cheaply? Why?
- 10 What countries are most interested in the manufacture of synthetic rubber? Why?
- 11 To what extent is rubber a luxury?
- 12 Does a depression hurt rubber prices more or less than it hurts food prices? Why?
- 13 What is the relation of sanitation to health? How does the above question apply to the tropics? (Read Justin, Margaret M., and Rust, Lucile Osborn, *Home Living*, pp 330-351.)
- 14 How does climate affect man in the tropics? (Read Ward, Robert DeC., *Climate*, pp 220-271.)

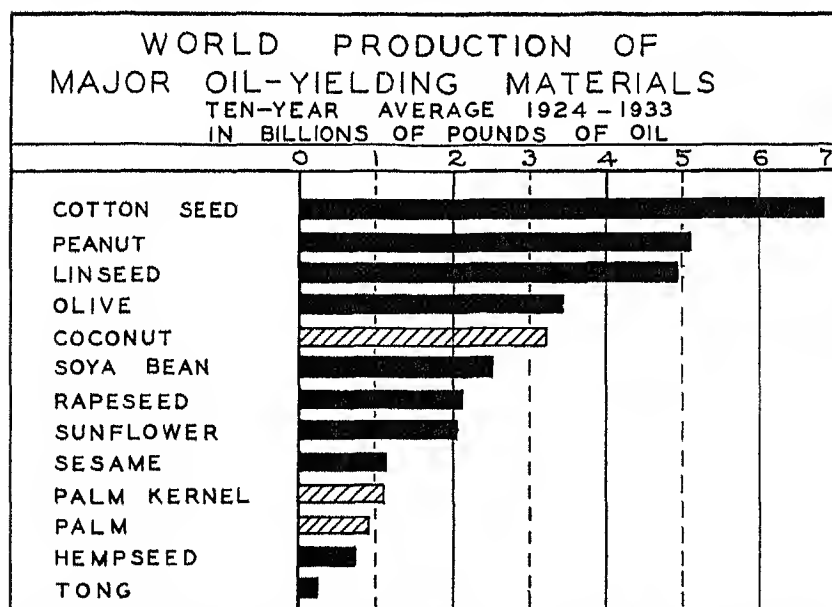
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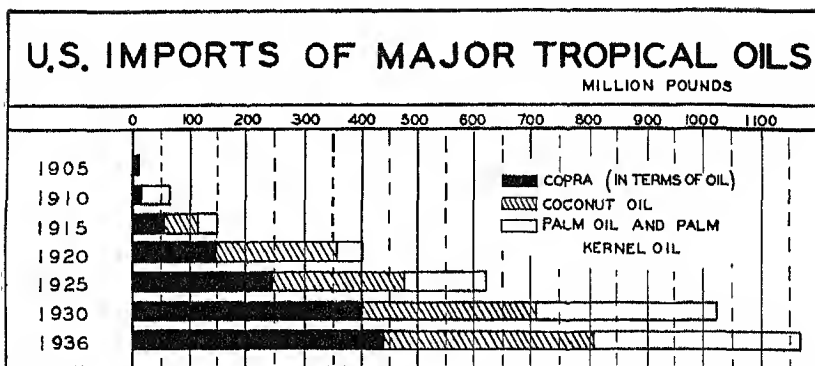
TROPICAL OILS, CACAO, AND COFFEE

Increasing need for tropical oils. During the past century the world supply of meat and the accompanying supply of animal fats have not increased as rapidly as the population. At the same time the standards of living have been raised in most parts of the world and the per capita consumption of fats and oils, both for food and for industrial purposes, has increased. Thus the peoples of the world, and especially of the temperate zones, have been compelled to turn more and more to vegetable oils as substitutes for animal fats. One of the major sources of these oils, and a source that affords possibilities of tremendous increase of production, is the Tropical Rain Forest.

Importance of tropical oils. Oils obtained from tropical vegetation have been used by the natives of tropical regions for thousands of



Oils of the coconut and palm are becoming important competitors of temperate-zone oils.



The importation of tropical oils into the United States is a development of recent origin. In 1905 the United States imported but a few million pounds of all tropical oils combined, whereas, during the last few years our imports have exceeded a billion pounds annually.

years. In some areas these oils have been used extensively since prehistoric times, and for several centuries have constituted a major food item for millions of people. During recent decades the output of tropical oils has increased until at present the average annual yield of oil from the coconut and the palm tree products exceeds 5,000,000,000 pounds (Illus., p. 663.) It is only recently, however, that tropical oils have become important products of international trade. In 1905, the imports of tropical oils into the United States amounted to only a few million pounds, whereas during the last few years they have exceeded a billion pounds annually. (Chart above.) Stated in more meaningful terms, the imports of tropical oils during 1934 represented approximately one gallon for each person, or five gallons for each family, of the entire United States. Most of these oils were products of the coco palm and the oil palm trees.

THE COCO PALM

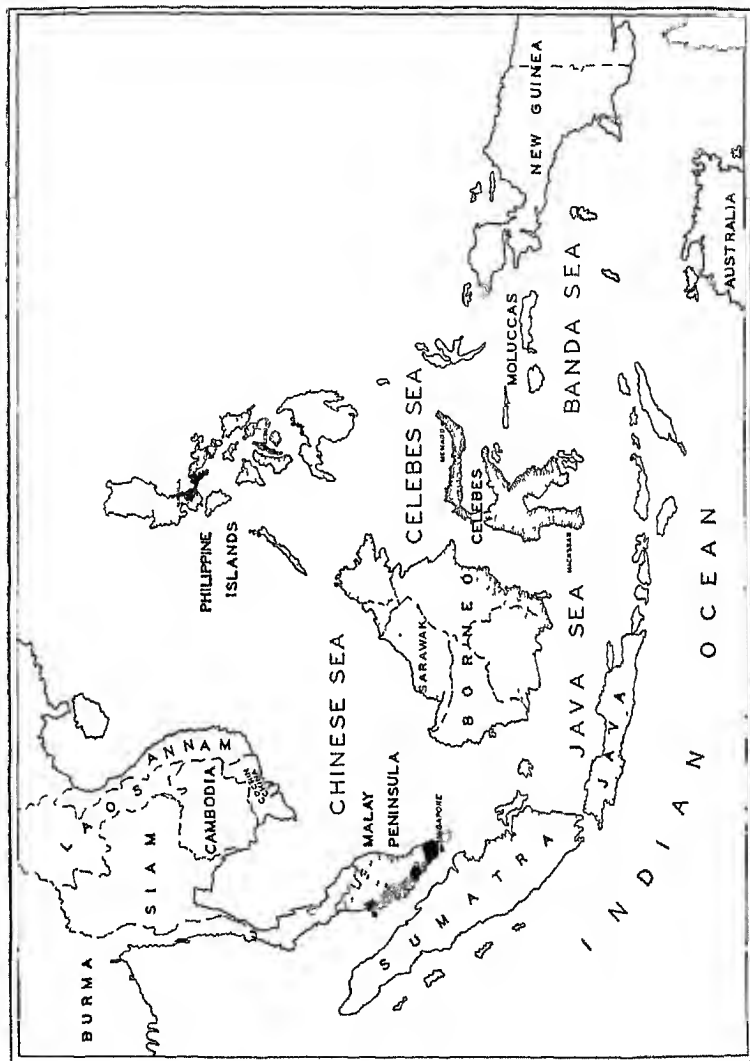
Importance. From the economic point of view the coconut palm (coco palm) is one of the most valuable trees of the entire tropics. Not only is the coconut the most important oil seed of the tropics, but in addition, the coco palm tree provides many other useful products. To the native it is a source of food, drink, shelter, and numerous utensils. The trunk provides timber for houses and wood

for tools. The leaves are useful for thatch roofs, mats, dishes, and baskets. The tender buds of the tree are eaten as vegetables. From the sap of the tree is made palm wine and vinegar. The milk of the nut is a wholesome drink. The shell of the coconut is fashioned into dishes, spoons, and cups. The fibrous covering of the shell is used for the manufacture of mats and ropes. And most valuable of all, the meat of the nut may be eaten raw or cooked, the oil may be pressed out of the nut and used as food or for the manufacture of soap or other chemical products.

Distribution of the coco palm. The most suitable habitat of the coco palm is found in coastal areas bathed by warm tropical seas. Accordingly, these beautiful palms line the shores of many tropical islands. The original home of the coco palm is not definitely known, for it is now grown on tropical coasts scattered entirely around the world. This distribution is easy to understand, since the coconut is light and will float for weeks. It may be carried on the waves of the sea for hundreds of miles. Consequently, the coco palm is common to almost every coastal region of the tropics, and is usually one of the first plants to grow on newly-formed islands of the tropical seas.

Although the coconut palm thrives on nearly all tropical shores, it is not surprising that most of the world's commercial crop is grown in the Middle East (East Indies, Philippine Islands, and southeastern Asia), and in the islands of the South Sea of which the most important groups are the Fiji, Samoa, and Society islands, and the Tuamotu Archipelago. The many islands of the East Indies and the Philippines, together with the major peninsulas of southeastern Asia, afford tens of thousands of miles of coasts suited to the growth of the coco palm. Moreover, for many centuries the region has supported millions of people who, needing the products of this palm, have planted the seed and cared for the trees. The Orientals have a saying that he who plants a coconut provides food, clothing, and utensils for himself and future generations.

Coco palm—the staff of life to South Sea Islanders. The South Sea Islands do not produce such large quantities of coconuts as are grown in the Middle East. This fact is readily understood by comparing the area of the land masses and the length of the coastline of the two regions. However, relative to the area of the land and the size of the population, the coco palm is much more important to the South Sea Islanders than to the natives of the Middle East. Many of the small islands of the South Seas are composed of coral reefs and



More than 90 per cent of the world's acreage of coconut groves is situated in the coastal areas of the East Indies, Philippine Islands, and southeastern Asia. Each dot represents 500 acres of coconut groves. Data for some of the smaller islands are incomplete.

coral limestone covered with but a scanty soil. Such islands are suited to but few crops other than the coconut. Accordingly, the coconut is the staple crop, and in places the only crop, of the South Sea Islands. Directly or indirectly the coco palm supplies all of the necessities of life to thousands of natives. In America the statement is sometimes made that bread is the staff of life. This certainly is not true in the South Sea Islands. There the coco palm is the "staff of life." The products of this stately tree, together with pork from hogs fattened on the coconut, constitute the major diet of thousands of natives of the South Sea Islands. Copra (dried coconut meat) as a commercial product is as important to the South Sea Islands as steel is to Pittsburgh, coal to Newcastle, or silk to Japan.

The coconut plantation. Coconuts are grown on large and small plantations owned either by tropical natives or by temperate zone capitalists. Most of the world's coconuts are grown on native plantations ranging in size from less than an acre to three or four acres. A few wealthy natives possess large plantations of several hundred acres. During the last few decades the increasing demand for coconut oil has resulted in the development of vast plantations operated under American or European management.

The first step in developing a large coconut plantation is to choose land that is well drained or that can be cheaply drained. Heavy, wet land, well suited for rice or sugar cane, is not favorable for coconuts; but an abundant underground water supply is desirable, provided the water is kept moving. Hence, sandy beaches are excellent for the coco palm, provided the soil contains a sufficient supply of plant food. Stony slopes, although difficult to plow, make very good coconut land, and where coastal land is not available, the planter may turn to near-by foothills, either for the purpose of enlarging his plantation, or in order that he may develop a new one.

Other steps necessary to the development of a plantation follow in order. First the land must be cleared of forest or of rank brush or grass, which may reach 10 or 12 feet in height. This task requires an immense amount of labor. Next the land is plowed several times, usually with small hand plows. In many parts of the Orient fences must then be built to keep out stray animals, especially hogs. Thus the development of a new plantation requires the expenditure of a great amount of labor.

The nuts to be planted are placed on top of the ground and packed closely together. They are allowed to remain that way for three

months or longer, until the seedlings sprout. These seedlings secure the nourishment for their early growth from the meat of the nut. Later they are set out in plantations, where they may secure added nourishment from the soil.

After the nuts are planted the land is usually turned over in three- to five-acre tracts to native tenant farmers. Where the soil permits, they make a living off the land by subsistence farming, while the trees are growing. Each farmer builds a house, perhaps of bamboo frame, covered with thatch of palm leaves. Then, with the aid of a carabao or an Indian ox, the native farmer raises corn, sweet potatoes, legumes, and other crops suited to the soil. Within seven or eight years the trees begin to bear and may continue to do so for 60 years or longer.

Harvesting coconuts. Picking coconuts is hard work. The nuts are cut from small trees by means of a knife attached to the end of a pole. The task of handling the pole requires considerable skill and energy. The crops of old trees cannot be harvested in this manner. Men must climb these tall trees and throw down the nuts. The task appears simple when seen in the movies, but in reality it requires the expenditure of a tremendous amount of energy for the possession of a few nuts. As the nuts are gathered they are thrown into piles ready to be shipped as fresh nuts to the consumer or for the manufacture of copra.

The manufacture of copra. There are three methods of drying the coconut meat, namely, sun-drying, grill-drying, and kiln-drying. The first method is most primitive and least reliable, but most widely practiced. (Photo opposite.) Drying coconut meat in the sun requires from four to seven days of good weather. In case of rain the meat must be sheltered with a cover, otherwise the copra is permanently ruined. Moreover, no matter how dry the weather, the copra should be sheltered at night. Sun-drying is the cheapest method of curing the meat of the coconut, but because of the intermittent rains which occur in best coconut-producing regions, and the careless method of handling by the natives, the product is seldom first-grade.

In almost every country where copra is produced some of it is grill-dried—that is, dried over an open fire made of coconut shells and husks. Such copra receives smoke and soot. Most of the Philippine copra is dried in this way. This method is cheap, simple, rapid, and independent of weather. It is not suitable, however, to the production of the finest grade of copra.



The sun supplies the cheapest heat for drying the meat of the coconut

In recent years kiln-drying (oven-drying) is becoming more common. The chief disadvantage of this method is the original cost of the oven and the cost of the fuel. This method of drying can be controlled so as to produce a clean product from which practically all of the moisture has been driven out by heat. It produces first-class copra, but because of the expense it is not widely used.

Commercial production. Although all parts of the coconut tree and its fruits are useful to the natives, the only products of international trade are those made directly from the nut or its fibrous covering. The major commercial products are copra, coconut oil, coconuts, shredded coconut, oil cake, and coir (the fibrous covering of the nut).

The demand for the commercial products of the coco palm is rapidly increasing. Fresh coconuts are exported in small quantities and have long been used by peoples of temperate lands as an occasional food. (Illus., p. 670.) To a much greater extent the dried coconut meat (copra) constitutes a source of oil for food and chemical industries and especially for the manufacture of soap. Recently a new chemical process has been discovered which changes coconut oil



A coconut raft This is one of the most economical methods of transporting coconuts in the East Indies and in the Philippine Islands.

with its strong and unpalatable flavor into a hard white fat from which the undesirable flavor is removed. This new process has increased enormously the demand for coconut oil by making it a suitable substitute for butterfat. Accordingly, there has been a tremendous increase in the demand for copra and a corresponding rise in the price of that product. In order to supply this new demand and the increasing need of oil for the manufacture of soap and cosmetics, the acreage given to coconut plantations has increased from 5,500,000 acres in 1921 to more than 7,500,000 acres in 1935. The need for this increase is indicated by the fact that at present approximately 60 per cent of the world production of coconuts is now grown for export, an industry of recent development. The possibilities of further increase are almost unlimited, as there are large areas of unused, or but little used, land suited to the growth of the coconut palm.

Trade in coconut oil fits in nicely with the trade in kerosene and other petroleum products. Tank ships are used to transport the oil from the Middle East to the industrial plants of western Europe and

eastern United States. Many of these ships, on their return voyage, carry oil for the lamps of China, India, and other Eastern lands.

The increasing use of oil results in the production of increasing quantities of coconut meal (the product that remains after most of the oil is pressed from the copra). This meal leaves the press in hard cakes which, since they still contain some oil, make excellent feed for cattle. It finds a ready market in the dairy regions of northwest Europe and of eastern United States.

Coir is the commercial name of the fiber prepared from the husk of the coconut. It is used in the manufacture of rope and for string with which to make fish nets. Coir will stretch fully 25 per cent without breaking. This quality makes it especially valuable for the manufacture of rope and strings that are to be subjected to jerks. The hardness, durability, and stiffness of coir make it a good material for the manufacture of door and hall mats, and for various kinds of brushes.

This growth in the commercial demand for the products of the coconut tree gives a cash crop to millions of natives who otherwise would have little to sell. With the cash income these natives are enabled to buy clothing, machinery, and a great variety of necessities and luxuries that they could not otherwise afford.

Major areas of commercial production. The two major centers of commercial production of copra are the Middle East and the South Sea Islands. The Netherland East Indies are by far the greatest producers of copra. In 1935, the total area given to coconut plantations exceeded 7,500,000 acres, more than one-half of which was situated in the Celebes and Moluccas, where the rainfall is heavy and where there are no dry seasons. Similarly, in the Philippine Islands, the largest areas given to the coconut palm are situated in areas where the rainfall is well distributed throughout the year.

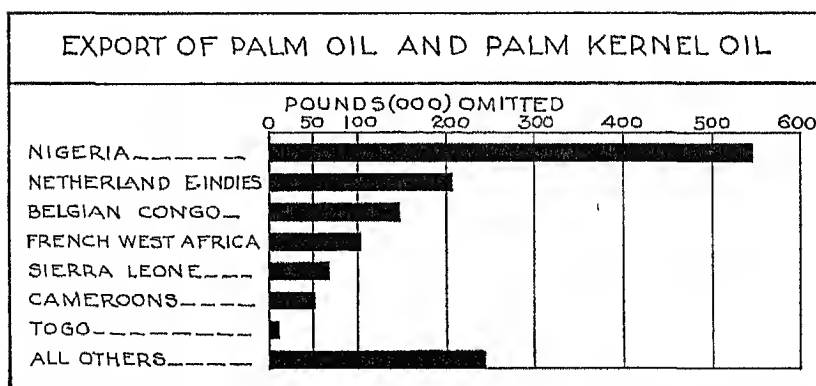
Consuming areas. Approximately 40 per cent of the coconut meat is consumed in the centers of production—principally in the Middle East and in the islands of the South Seas. Most of the remaining 60 per cent is shipped either as copra or as coconut oil to the industrial nations of the world, especially to the countries of western Europe and to eastern United States. In western Europe a large percentage of the oil is used for the manufacture of margarine, a cheap butter substitute, and a smaller portion is used for the manufacture of soap and other toilet articles. In the United States more than one-half of the oil is used for the manufacture of soap, but an increasing

quantity is used for the manufacture of margarine and other food products

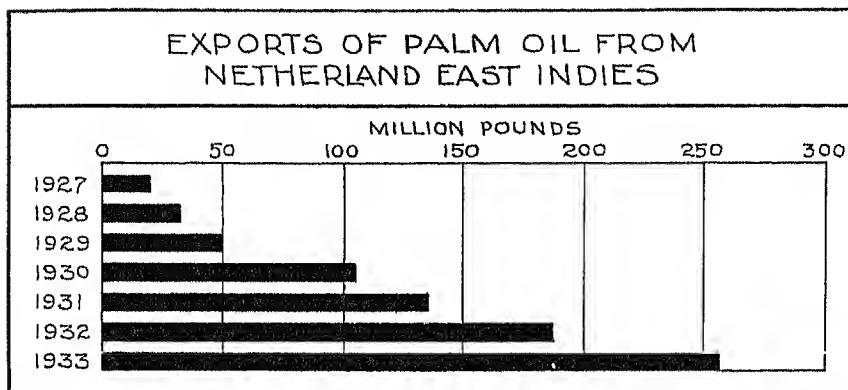
THE OIL PALM

The oil palm, native of Africa, is a competitor of the coconut palm in supplying millions of natives of the wet tropics with food, and the industrial countries with large quantities of commercial oils. Like the coconut palm, the tree requires hot, moist climate conditions throughout the year. Unlike the coconut palm, it flourishes in the interior of a continent as well as along or near the coast. For the best growth, the tree needs high temperatures, high humidity, and an annual rainfall of more than 80 inches, without any pronounced dry season.

The native habitat of the oil palm is a wide expanse of land extending throughout most of West-Central Africa and the Congo Basin. (Chart below) Here the trees are found scattered throughout much of the forest region. In clearing the forest the natives have protected the oil palm and have planted others so that in many places they now stand in solid groves. In large areas the oil palm surrounds every village and is the most prominent object of the cultural landscape. In the warehouses of almost every trading station of the Guinea Coast and at the railroad stations of West-Central Africa one finds casks of oil and tons of kernels waiting to be shipped to the markets of western Europe and eastern United States.



The Equatorial Rain Forest of Africa still produces more than 80 per cent of the world's supply of oil palm products. The oil palm tree is widely scattered throughout West-Central Africa.



The palm oil exports of Netherland East Indies have increased very rapidly during the last few years

Recently oil palm plantations have been developed in the Middle East. The Netherland East Indies have now developed more than 50 oil palm estates with a total area, in 1933, of nearly 200,000 acres, and the commercial production of plantation palm oil and palm kernel oil is rapidly becoming important.

Production and commerce. The fruit of the oil palm is a small nut one to two inches in diameter, but it grows in bunches which usually contain 1,000 to 1,500 nuts each. The nut consists of a soft pericarp or covering and a hard kernel. From the former is made the palm oil, and from the latter the palm kernel oil.

The native climbs the tall oil palm trees, cuts off the large heavy bunches of nuts, and lowers them to the ground. He then carries them to the village. Here women cook the nuts for a time in boiling water. When the fruit is sufficiently cooked it is put into a large trough where the pericarp is either trodden or pounded into a pulp. This process causes the oil to rise in fatty masses to the surface, where it is scooped off with bare hands and put into jars. The resultant product is once more put over the fire and boiled until all of the water is evaporated. The oil is then ready to be put into casks for shipment to the world markets.

The nuts, with their pericarp now removed, are dried in the sun, after which they, too, are ready for the market. This primitive method of preparing palm oil and palm kernels for the market is being slowly replaced by modern methods in the plantations of the East Indies and in some parts of Africa. Yet these primitive methods

of production are still used to procure a large part of the palm oil and palm kernels which now enter the channels of commerce

The growth of the commercial palm oil and palm kernel production has been exceedingly rapid. In 1900 only a few million pounds entered the world markets, whereas in 1931 the total exceeded 1,000,000,000 pounds. Until very recently, most of this came from British and French West Africa and from the Belgian Congo. However, the plantations of Netherland East Indies are rapidly becoming dangerous competitors of Central Africa. The oil produced on these estates is more carefully prepared and is, consequently, more valuable per pound than the native oil. Moreover, the plantation owners select the best palms, plant them in fertile soils, give them excellent care, look after the welfare of the laborers, and in other ways aid in scientific and economic production of the oil palm products.

Consequently, in spite of the fact that the palm oil plantations of Netherland East Indies have been developed since 1910, the industry

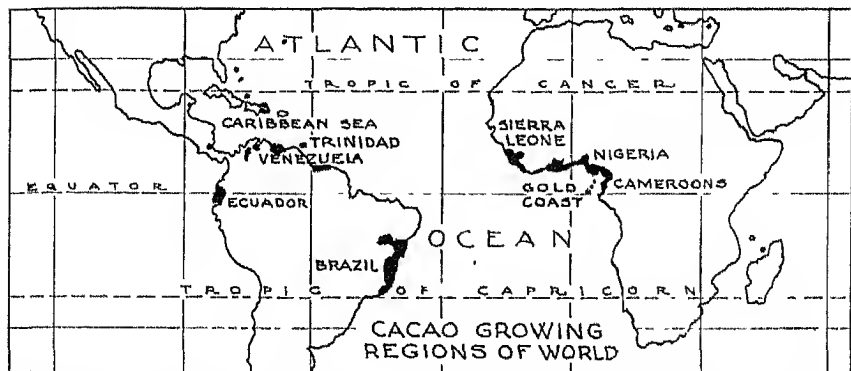
has already grown to considerable proportions and within a few decades the East Indies will probably lead in the production of palm oil and palm kernel just as they now lead in the output of rubber.

CACAO

Habitat. Cacao (sometimes called food of the gods) is one of the most typical products of the warmer portions of the humid tropics. It is the bean from which the commercial products, chocolate and cocoa, are made. The beans grow in large pods that are attached close to the trunk of the tree. (Picture at left.) A



The fruit of the cacao tree is a tough-skinned pod which contains several dozen beans imbedded in a soft, slimy pulp. These beans must be removed from the pulp and cured before they are ready for market. (Copyright by Publishers Photo Service.)



Hot, moist, shaded, and unhealthy climates are best suited to the cultivation of cacao. (Compare with the Equatorial Rain Forest, Illus. p. 639.)

large amount of work is required before the beans are ready for sorting and grading in preparation for shipment to the world market. The ideal habitat is to be found in the Equatorial Rain Forest, where the annual rainfall exceeds 60 inches and where the average temperatures exceed 75°F . Minimum temperatures of 60°F injure the crop, and a few degrees below 60°F injure the tree. (See Chap. 34.) A humid atmosphere, but little wind, and forest shade are also conducive to a large yield of fruit. These exacting climatic conditions exist only in the lowlands relatively close to the Equator. (Map above.) A little cacao is grown at considerable distances from the Equator, in the Dominican Republic and Jamaica. Yet, in spite of the fact that these islands are constantly bathed by winds of a warm sea, their temperatures are occasionally too low for the production of large crops.

Uses. The Spaniards found chocolate in common use among the Mexican Indians at the time of the invasion by Cortez in 1519. The Indians were not only using chocolate as a staple food, but they also used cacao beans as a medium of exchange.

The Spaniards introduced chocolate into Spain early in the sixteenth century but almost 200 years passed before the product was extensively used in Europe. During most of this long period the quality of chocolate was poor and the cost high. Moreover, the sugar necessary to give a delightful flavor to a product otherwise bitter was also expensive. Thus in 1806, almost 200 years after chocolate had been introduced into Spain, the people of Europe used only about 23,000,000 pounds of cacao beans. Since then the annual consumption



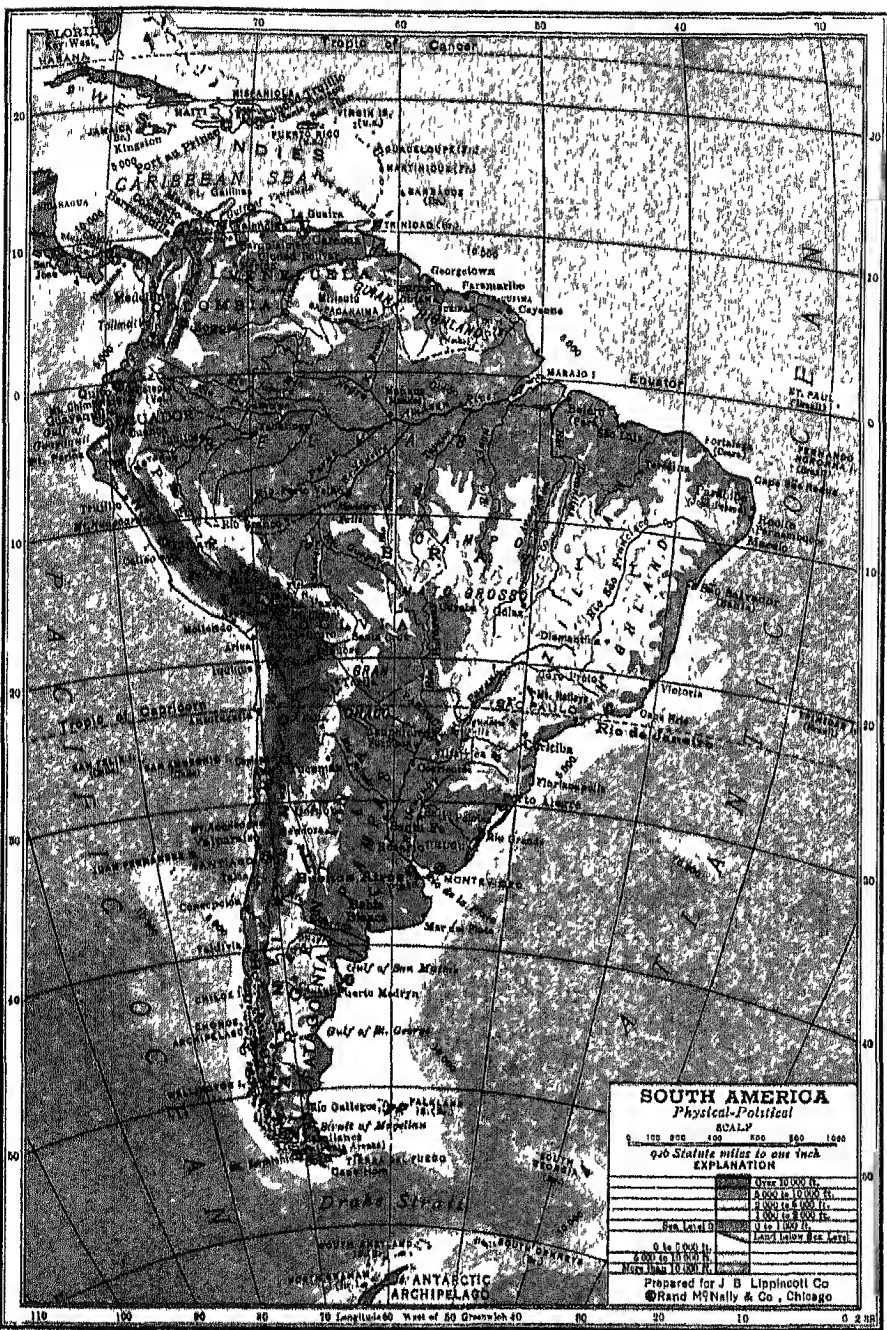
Plucking and transporting cacao pods from the cacao trees, Gold Coast Colony (Photo by Justus A. C. Holm; courtesy U. S. Dept. of Agriculture.)

by European peoples has increased more than tenfold, and the annual international trade in cacao beans exceeds 1,000,000,000 pounds.

Cacao plantations located in unwholesome regions. As previously stated, practically all of the cacao crop is grown in the hot, damp coastal belts of Latin America and of West-Central Africa. No other important commercial crop is grown under conditions more conducive to the ravages of disease and of insect pests which attack both man and his crops. Yellow fever (now brought largely under control), malaria, dysentery, hookworm and many other tropical diseases have taken and still take a frightful toll of human life and energy each year. Similarly, diseases and in-

sect pests have repeatedly destroyed the cacao crop of large areas and have killed millions of trees. Nevertheless, since the fruit makes wholesome food products and a delightful drink, the demand for it has steadily increased. Laborers can always be found who will work under such unhealthful conditions and scientists have been able to prevent the complete destruction of plantations.

Production. There are several species of cacao trees, but until a few decades ago most of the commercial crop of cacao beans was produced from *Criollo*—a species that, although not very resistant to disease, produces beans of superior quality. Many Latin American estates still emphasize the production of *Criollo* trees, because of

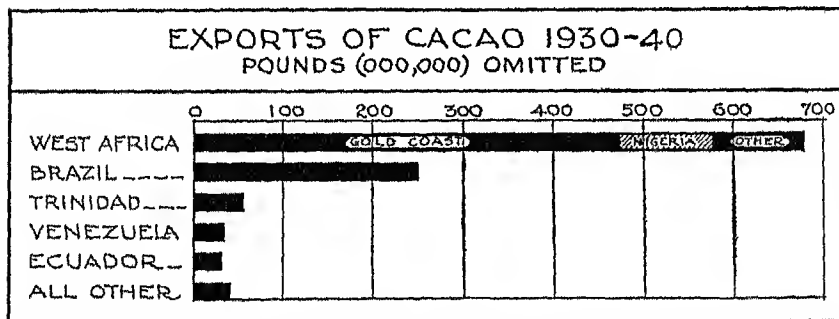


the excellent quality of the fruit. As a result many of the plantations of Latin America have suffered tremendous losses from disease. For example, during the years following 1930, many of the plantations of Ecuador were almost destroyed by diseases which the *Criollo* were not suited to resist.

Several decades ago planters began to experiment with the *Forastero*—a hardy species of cacao tree, and one resistant to disease. Several thousand of these trees were planted along the west coast of Africa and were found to thrive and to produce abundant crops even when given but little care. Thus, the introduction of the *Forastero* brought with it major changes in cacao production. Thousands of natives of equatorial Africa began to grow cacao for the market. Many of these natives feel tired most of the time and do not take proper care of their trees. However, the *Forastero* produces in spite of poor care. If, on the other hand, less hardy trees such as the *Criollo* were planted by them, disease would probably spread from one plantation to another and might ruin the entire industry.

The fruit of the *Forastero* has an aroma which many people consider decidedly inferior to that of the *Criollo*. Since the cacao of tropical Africa, which now approximates two-thirds of the world crop, is produced largely from *Forastero*, it is, consequently, of low grade. The finest grades of cacao still come from Latin American countries, especially Ecuador, Venezuela, and the West Indies, where the *Criollo* is cultivated, and where the industry is more skillfully developed than in Africa.

Since the introduction of cacao plantations in West Africa a few decades ago, the industry has grown with remarkable rapidity.



Most of the cacao of international trade is grown in West Equatorial Africa and eastern Brazil; whereas most of it is consumed in eastern North America and western Europe.

Today, the forested belt along the Gulf of Guinea is the largest cacao-producing region in the world. The Gold Coast alone yields approximately one-half of the world crop, and millions of pounds are grown in Nigeria and French West Africa, especially along the Ivory Coast.

Seasonal influences in harvesting, curing, and marketing cacao. The cacao beans ripen at all times of the year, but the principal harvest season coincides with the season of least rain, when the beans may be most easily harvested, cured, and marketed. During wet seasons many of the plantations are flooded, and occasionally the beans are harvested from a boat. Such methods of harvesting are, fortunately, unusual.

Fair weather not only aids in harvesting the crop but also in curing it. The beans after being removed from the pod, are normally dried in open trays or on platforms open to the full heat of a tropical sun. Generally the laborers in charge of the drying processes are provided with oilcloth with which to cover the beans in case of rain, or, in some cases, sheds are constructed close to the drying platforms in order that the beans may be taken under cover in case rain threatens.

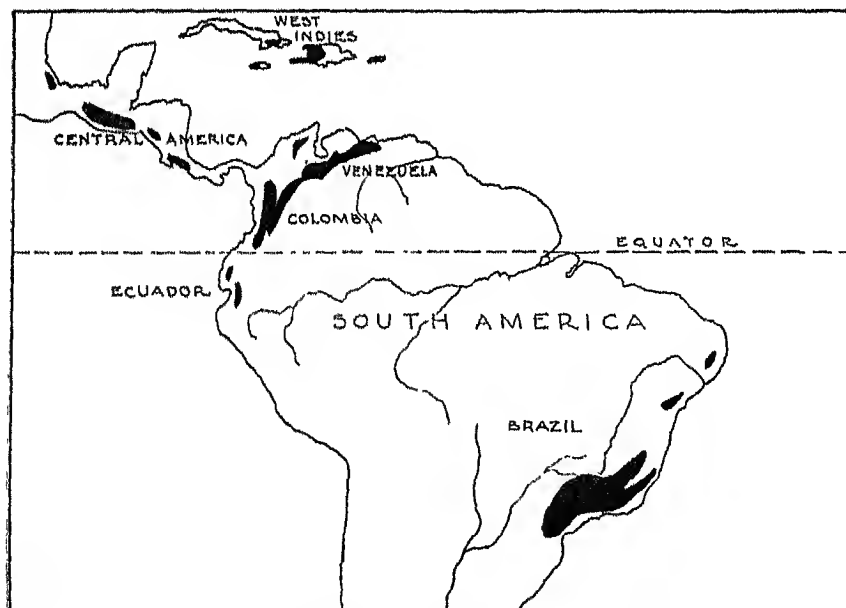
After the beans are dried they are transported to the local African seaports by boat, railroad, or by human carriers. During the wet season, bridges may be washed out, railroad tracks may be flooded, and swollen streams without bridges may be difficult to cross. Consequently the dry season is also the best time of year to market the crops.

Consuming centers. Most of the cacao of commerce is shipped to the industrial countries of western Europe and to the United States. New York is by far the most important cacao-importing city in the world. Normally, the United States consumes almost two-fifths of the world's commercial output, and approximately three-fourths of this amount is shipped to New York City. London, Hamburg, Marseilles, and Havre are the major importing centers of Europe. From these great centers most of the dried beans are shipped to the manufacturing plants, where chocolate, prepared cocoa, and a great variety of chocolate and cocoa products are manufactured. The large per capita consumption of cacao within the United States results from the fact that (1) this is a wealthy nation and the people can afford to buy the products that they desire; and (2) chocolate is a tasty and wholesome food, and its good qualities have been widely advertised in all parts of the country.

COFFEE PRODUCTION AND CONSUMPTION

Demand for coffee. With the exception of tea, coffee is the world's favorite beverage. Estimates indicate that 150,000,000 people drink coffee every day, and that it is probably on 50,000,000 breakfast tables each morning. More than 20,000,000 families living in the United States alone demand a continuous supply of this product, and it requires approximately 40 per cent of the entire world crop to provide the needs of this market. Most of the remainder of the crop is consumed in western Europe or in Latin American countries. The teeming millions of Asiatics depend largely upon tea instead of coffee as a beverage.

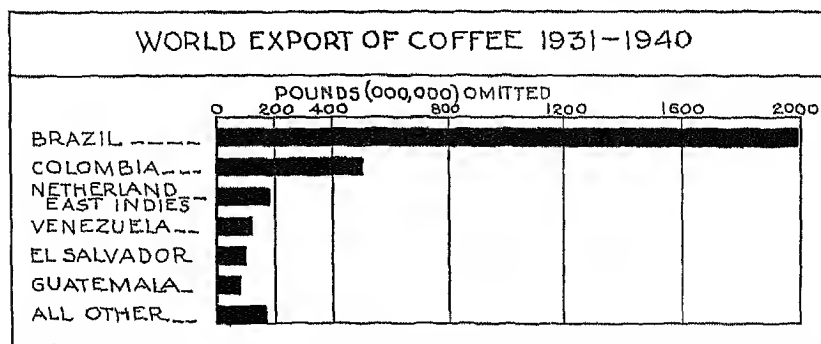
Where coffee is grown. Coffee is a product of the tropics. However, its cultivation is not carried on in the hot, wet, unwholesome lowlands that are so closely associated with the production of rubber, cacao, tropical oils, and bananas. Coffee is a product of the more pleasant, invigorating, and healthful highland areas. This fact is strikingly illustrated by contrasting the highland climates of the coffee lands of Brazil, Central America, and East Africa with the lowland climates suited to the production of rubber, cacao, and bananas.



Principal coffee-producing areas of Latin America.

Practically all tropical highlands, which lie at elevations of 3,000 to 9,000 feet, are suited to coffee provided they are well supplied with moisture (Illus., p. 679) In fact, coffee is an excellent commercial crop for these rugged, and in certain cases highly isolated, lands. Coffee is a relatively nonperishable product and may, therefore, be stored in warm, moist climates for months or even years without spoiling; it has a wide market and is always in demand, it is a product of high value per pound and can stand the expensive transportation costs that are usually associated with these rugged areas; and it is a hardy tree-crop that will usually yield something, although perhaps not abundantly, even with poor and careless tending. It is only natural, then, that coffee should constitute the most valuable commercial crop of many of the rugged, isolated tropical highlands occupied by backward peoples. It must be clearly understood, however, that ruggedness of land, isolation of area, and backwardness of people do not favor coffee production. These factors merely prevent the profitable production of most other commercial crops and thereby compel the natives to turn to coffee as their most suitable cash crop.

Brazil, the leading producer of coffee. Although coffee is widely scattered in many tropical highlands, one area—the São Paulo District of southern Brazil—normally produces from 60 to 70 per cent of the entire world crop. (Chart below) Whenever a single country produces such a large percentage of any widely used commodity, you may be certain that the country possesses advantages for the production of that particular product. Accordingly, we discover



Approximately 90 per cent of the world's coffee crop is grown in Latin America, with Brazil producing almost twice as much coffee as all other countries combined.

that the São Paulo District is especially fitted for growing coffee

Excellent climate for coffee culture Coffee seems to do best in regions of cool winters; yet neither the crop nor the tree can stand severe frosts. Within the São Paulo District, situated on a highland near the borders of the tropics, the temperatures drop each winter to near freezing, but frosts seldom occur in the coffee plantations. This freedom from frost is partly a result of the fact that the plantations are situated on hill-slopes in a land of rolling topography, and are therefore protected by air drainage. (For an explanation of the principle of air drainage, review Chap. 12, pp. 163-164)

The best growth of coffee requires an annual rainfall of 40 to 50 inches, with heavy precipitation during the growing season (spring and summer), and light rainfall during the ripening and picking season (fall and winter) Of course the water may be supplied by irrigation, but most of the world's coffee crop is grown without the artificial application of water The amount and distribution of rainfall at São Paulo fits nicely these requirements

Favored by sharp ripening season. In most coffee-growing areas the coffee does not all ripen together Blossoms and green and ripe berries may all be seen on the tree at the same time The São Paulo District, however, has a sharp coffee-ripening season. That is, most of the berries ripen at about the same time. This sharp ripening season is largely a result of climatic conditions. The dry season and the cool season both come at the same time. Either drought or cold weather tends to hasten the maturing and ripening of coffee berries, and when they both come together, as in southern Brazil, they bring about the decidedly sharp ripening period. This fact greatly facilitates the harvesting of the crops. Thus, when all of the coffee ripens together the berries may be picked a handful at a time, merely by stripping the branches. When, however, blossoms, green berries, and ripe ones are intermingled on the twig, the crop must be picked a berry at a time, in order to harvest only that part of the crop which is properly matured. Such a method of picking requires a large amount of time and human effort.

Favorable soil for coffee. Coffee, like a great many other crops, will grow in a variety of soils. It does best, however, in a fertile soil that is especially rich in iron and potash. Again we discover that the São Paulo District measures up to these needs. Much of the soil is of volcanic origin and is rich not only in iron and potash but also in the other mineral plant foods.

Favorable facilities for marketing coffee. As previously stated, coffee is a product of high value per pound and is relatively non-perishable. The cured berries, accordingly, can stand delay in shipment without excessive deterioration, and can bear the cost of high-priced transportation. It is obviously an advantage to the producer, however, if such delays and expenses are not necessary. In this respect, as in others, we find southern Brazil favored. The São Paulo District is close to the coast and is linked to Santos and Rio de Janeiro by excellent railways. Furthermore, an exceptionally good network of railways has been developed on the plateau, providing the coffee planter with good transportation facilities and cheap freight rates.

These conditions contrast sharply with the more isolated coffee-producing districts of Colombia and Central America. In these latter areas much of the coffee is transported by human carriers or on the backs of pack animals, before it reaches the railway. And even the railroads of these rugged lands are difficult to build and expensive to keep in repair. Consequently, railroad freight rates are high. Venezuela, the second largest coffee-producing country in the world, is but little better off than Colombia and Central America with regard to the costs of freight.

Favorable labor supply. The coffee district was settled by Italian colonists, who found the area sparsely populated. Such conditions made it easy to gain possession of land for the development of large plantations, but difficult to secure a good supply of cheap and efficient labor. Fortunately the colonists found that the cropping system of Italy dovetailed nicely with that of the coffee plantation of Brazil, so that Italian labor could be profitably employed. That is, the busy season in southern Italy is fall and early winter, when the olive crop is being harvested. The busy season of southern Brazil is also fall and early winter, when the coffee crop is being harvested. But the two areas lie in different hemispheres. Consequently, fall and winter (the rush season) in Italy is spring and early summer (the slack season) in southern Brazil. Thus the Italian laborers could work in the olive orchards of Italy during the harvest season and then go to Brazil in time to harvest the coffee crop. During the last few decades, however, large numbers of Italians have emigrated to Brazil, so that at present there is but little demand for imported Italian labor to harvest the coffee crop.

Superiority of the São Paulo District for commercial coffee culture. As we have already noted, coffee culture is widely practiced throughout the highland area of the tropics. Many widely scattered districts are capable of producing large quantities of high-grade coffee. Nevertheless, it is probable that no other area in the world is so ideally suited to the commercial production of coffee as is the São Paulo District of southern Brazil. The climate of the region is well suited to coffee culture; the soil is fertile and is especially adapted to the coffee crop, and the ripening season is sharp, thus facilitating the harvesting of the berries. Moreover, the marketing facilities of the São Paulo District are superior to those of most other coffee-growing areas, and the coffee planters have been able to secure a cheap but efficient labor supply at harvest time. Other coffee-growing areas have some of these advantages for the production and distribution of their crop, but it is doubtful if any other large region possesses all of them.

QUESTIONS AND EXERCISES

1. What factors have favored the rapid increase in the commercial production of tropical oils during the last few decades?
2. What are the advantages of producing tropical oils in plantations as compared with its production in the native forest?
3. What are the uses of coco palm products within the tropics?
4. What are the uses of coco palm products within the temperate zones?
5. What is the best habitat (home) of the coco palm?
6. Why are coco palm products well suited to international commerce?
7. What factors favor the Middle East for the production of coconut products?
8. What methods are used in drying copra? Which method results in the best product? Why? Which method is most widely used? Why?
9. How is the trade in coconut oil related to trade in kerosene?
10. Why have oil palm plantations developed more rapidly in the Netherland East Indies than in Brazil?
11. Which tree is more valuable to tropical peoples, the coco palm or the oil palm? Why?
12. What factors have favored a rapid increase in the production of cacao during the last three decades?
13. Is the climate that is well suited to cacao production well suited to the white man? Explain.

- 14 How has science helped the cacao producer?
- 15 How do weather conditions influence the cultivation, harvesting, and marketing of the cacao crop?
- 16 What factors favor Brazil for the production of coffee?
- 17 What is meant by air drainage? Explain
- 18 Write a composition on the subject. The Region Within the Tropics That I Like Best

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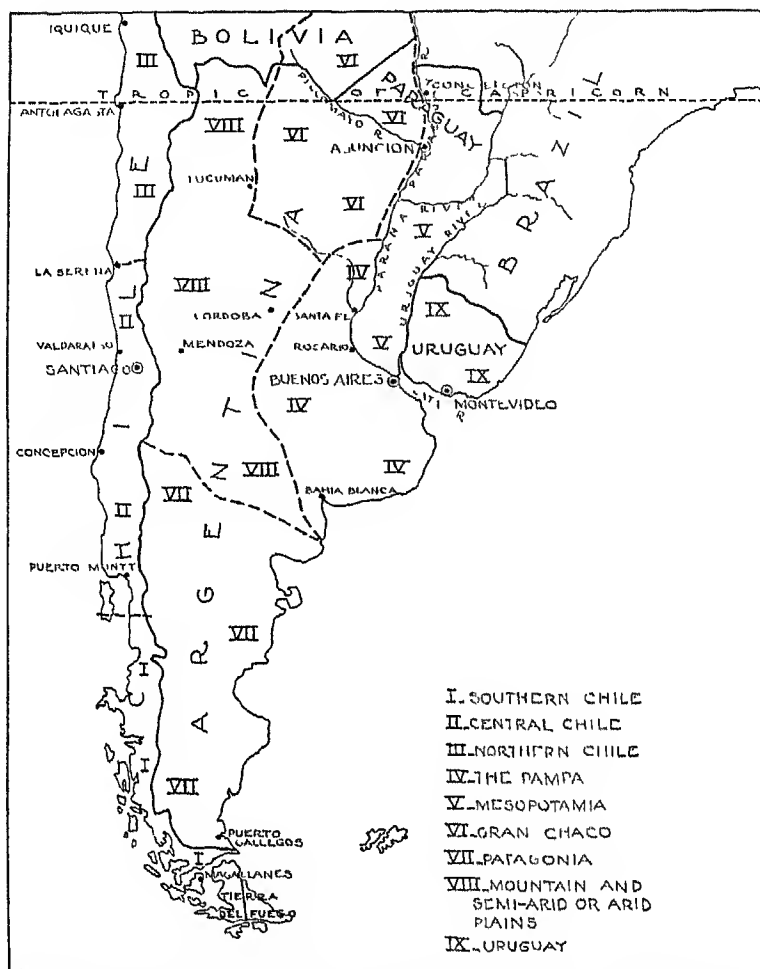
MIDDLE-LATITUDE SOUTH AMERICA

A land of opportunity for European peoples. Middle-Latitude South America is approximately one-half as large as the United States, but it supports less than one-sixth as many people. (Illus, p 686.) This low density of population exists in spite of the fact that the region is well suited to development by Europeans.

The climates of most of the area are relatively pleasant, invigorating, and healthful. Large sections of each of the countries—Argentina, Uruguay, Chile, and the temperate portions of Paraguay and Brazil—possess climates and soils that are productive of abundant vegetation. The area is noted for its unusual forests, excellent farm land, and fine pastures. It also contains some relatively barren and worthless regions, as might be expected in such a vast territory. Fortunately, most of the land is adapted to the same types of pastoral and agricultural industries that were already known to the Spanish settlers when they first arrived in South America.

When first discovered, Middle-Latitude South America was sparsely populated. Little of the soil was actually used by the Indians except as an exceedingly poor hunting ground. At that time, the natives of South America had no valuable domestic animals except the llama and alpaca. These wool-bearing animals were adapted to the Andean Highlands, but were not raised in the more fertile and productive lowlands. The Indians possessed corn, potatoes, and tobacco, but their cultivation was largely limited to the Andean Highlands, to the irrigated sections of the Andean foothills, and to semitropical regions. Only small patches of cultivated land were to be found in the vast plains of the temperate zone. Such conditions afforded the finest opportunity for the Europeans to introduce their own crops and animals into this section of the New World.

Thus, natural conditions were such as to make it easy to transplant European civilization in the large area now known as Argentina, Uruguay, Chile, and southern Paraguay and Brazil. The climates were moderately healthful and productive; the soils were unused and fertile; and no new diseases were encountered by either man or his domestic animals, except along the tropical border of this region.



Natural regions of middle-latitude South America This vast area is approximately one-half as large as the United States, extending from the Tropic of Capricorn southward approximately 35 degrees. It has a great variety of climates and contains mountains, plateaus, and plains. It is only natural that in such an area man's relations to his environment would vary greatly from one region to another.

Within large areas European peoples constitute practically the entire population. This is especially true of large parts of Argentina and Uruguay. The pure-bred Indian has almost disappeared, except in isolated sections along the tropical border of the region (northern Argentina and Paraguay, and isolated sections of Chile).



The peoples of Central Chile are largely of Spanish blood

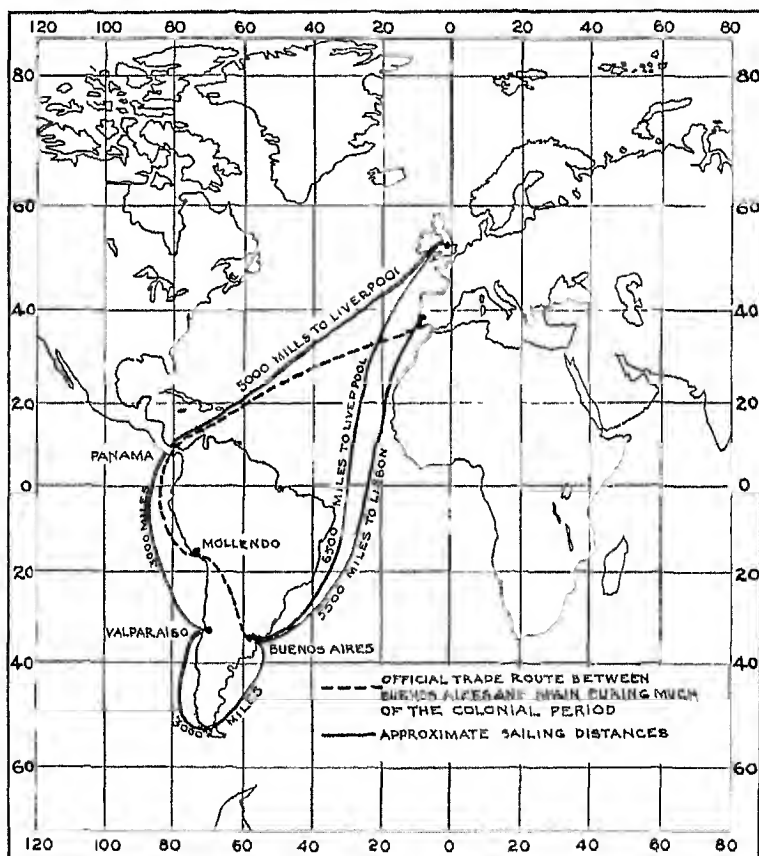
The Chilean peoples are neither white nor Indian. Most of them are a mixed race with both Spanish and Indian ancestry. Around Santiago and throughout the central valley Spanish blood strongly predominates. The inhabitants of the northern desert region and of the southern forest area are largely Indians and Mestizos.

Cattle, horses, sheep, and goats that were imported from Europe did just as well in their new home as in the old one. Moreover, the variety of climates found within this new land made it possible to grow within its borders every crop of Europe. Olives, oranges, grapes, wheat, barley, rye, oats, flax, and other European crops were all suited to some section of the new land.

Development of resources a slow process. As already indicated, nature made it easy for Europeans to transplant their own civilization to temperate South America. Yet several factors tended to retard the settlement of the area and to delay the development of its resources. The most important factors retarding progress were these: (1) The region was remote from Europe. (2) The Spanish colonies were used for the enrichment of Spain. (3) The type of settlers was poorly suited for the development of industry or for the promotion of a

stable form of government (4) The United States and southern Canada were more attractive to European emigrants than were even the best portions of South America (5) No portion of South America possessed a well-rounded supply of raw materials for industrial development

Isolation of Middle-Latitude South America. Buenos Aires is more than 6,000 miles from Spain and still farther from the great trading centers of Europe. By way of the Strait of Magellan, central Chile is more than 9,000 miles from most of the great ports of Europe. (Map below) These were long distances during the days of the slow and unreliable sailing vessel. Moreover, three calm



Trade routes between Europe and South America in the Colonial Days. Europe was a long distance from temperate-zone South America. The official route from Spain to Buenos Aires was not only long but difficult.

belts lie between the ports of Europe and Buenos Aires; namely, the two extra-tropical calm belts and the Belt of Equatorial Calms. Sometimes sailing vessels, for lack of wind, would be weeks or even months in crossing these calm belts—A danger admirably portrayed in the story of the Ancient Mariner. Sometimes sailing vessels loaded with livestock would get caught in a calm belt, and it would be necessary to throw the animals overboard in order to save the fresh water for human beings.

Such long distances, combined with poor transportation facilities, were suitable for the shipment of gold, silver, and other nonperishable products of high value and small bulk. They were poorly suited for the transportation of meat, wheat, corn, and other food products that are more or less perishable, and that are relatively bulky for their value. Even cargoes of hides sometimes spoiled during their passage through the hot, moist equatorial zone.

Unfortunately, this region was not rich in furs, gold, or silver—products that would have been suited to such transport facilities. Neither did the region become an important producer of tobacco, a product relatively high in value per pound, and one that is but slightly perishable. Thus, in early days isolation retarded the commercial development of those industries best suited to the region—the pastoral and agricultural industries. On the other hand, resources suited to the transportation facilities of the time either did not exist within the region or were not developed.

Spanish colonies used for the enrichment of Spain. During the the early colonial period, every European country looked upon its colonies as existing primarily for the benefit of the mother country. Spain, however, carried out a policy that was especially injurious to her colonies. She excluded from her colonies both foreign peoples and foreign ideas. She also made the trade of her colonies a Spanish monopoly. That is, all colonies were forbidden to trade with any country except Spain.

In order to regulate the foreign commerce of her colonies, Spain passed laws that made trade with some of them practically impossible. For example, in 1599 Spain forbade the area now included within Argentina, Uruguay, and Paraguay to trade by way of the Atlantic Ocean. All lawful trade with that vast area had to go by way of the Pacific Ocean. That is, all imports from Spain were shipped in sailing vessels to the eastern coast of the Isthmus of Panama. From there they were transported on mule-back to the Pacific coast.

The goods were then loaded in sailing vessels and shipped to Callao. From this port the goods were once more transported by land over the difficult passes of the Andean Mountains into the great Atlantic-facing plains. Goods exported from Argentina moved over this same route in the opposite direction. (Illus , p. 688) Because of the great expense involved in following such a route, legal trade with Argentina, Uruguay, and Paraguay was practically prohibited.

This region, denied legal trade by way of the Atlantic Ocean, developed contraband (illegal) trade on a large scale. Great quantities of hides, horns, and tallow were smuggled out by way of the east coast. These goods were shipped to England, France, and other countries of Europe with the exception of Spain. Thus, the efforts of the mother country to retain the colonial trade for herself resulted in her loss of most of it to other countries.

Settlers poorly suited to build a great democratic nation. The peoples who settled southern South America were not so well qualified to build a great and powerful democratic nation as were those who settled the United States. A comparison of the peoples who settled the two regions will illustrate this fact.

Most of the early immigrants to the United States were men and women who were rebelling against conditions which then existed in Europe. The Puritans who settled in New England, the Huguenots who settled in South Carolina, and the Germans who settled in Pennsylvania left their homes in the Old World because of religious persecution. Many Scotch and Irish came to this country because of economic distress at home. This distress was partly the result of the British policy of favoring English agriculture and industry, and thereby limiting the economic opportunities in Ireland and Scotland.

Of course many of the early settlers who came to the United States were merely seeking economic opportunity. They did not come because of any special opposition to conditions in Europe. This was especially true of the Virginia planters. However, as previously stated, many people came to this land because they rebelled against various forms of oppression in Europe. These peoples were willing to suffer many hardships in order to secure political, economic, and religious freedom. They desired this freedom not only for themselves but also for their descendants. Moreover, they soon instilled in others this same desire for freedom. These early settlers had many of the same qualities that were later possessed by the men who declared: ". . . all men are created equal, and are endowed by their

Creator with certain unalienable rights, that among these are life, liberty, and the pursuit of happiness."

Furthermore, the great diversity of religious beliefs held within the United States was sufficient to prevent the establishment of religious uniformity. Men who had crossed the ocean and had braved the wilderness to escape economic, political, or religious oppression in Europe were willing to fight against such oppression in their new home.

Thus many of the early immigrants to the United States were peoples who sought a new home in which they could control their own destinies. Although mainly English, peoples from Holland, France, Spain, Germany, and other countries of Europe were well represented within the several colonies. They spoke various languages and held many religious beliefs. Yet most of them were alike in one respect—they had a burning desire for freedom. Moreover, they were the type of people who would not willingly accept any classification of society that would permanently keep them submerged in a lower class.

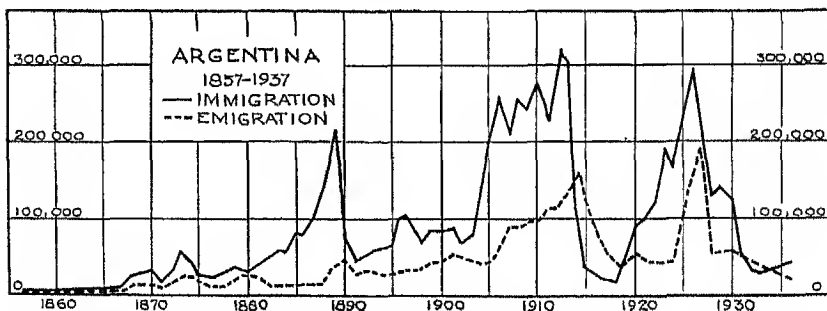
The story of settlement in South America differs markedly from that of settlement in the United States. Soon after the discovery of America, marvelous tales reached Spain of the rich stores of precious metals to be found in the New World. At the same time Spain learned about the heathen peoples who occupied this new land. Such stories appealed to the warriors seeking riches and glory, and to the priests who were interested in the salvation of souls. For many decades these two tasks (seeking gold and saving souls) occupied a large part of the time and energies of the Spanish immigrants. These early immigrants were not primarily farmers seeking homes in a new land; they were not peoples of diverse races, languages, and political faiths, all seeking freedom in a new land; they were not rebels who fought against religious, economic, and social injustices. Instead they were all Spaniards, all of one religion, all loyal citizens of Spain, and all obedient to the Spanish government until the oppression became intolerable. Many of them were men seeking a short-cut to wealth and fame.

These conditions made it possible for Spain to be rather successful in excluding from her territory both foreign peoples and foreign ideas. She was also successful for a time in making colonial trade a Spanish monopoly. All lawful trade of the colonies was carried on wholly with Spain and in Spanish ships. Moreover, Spanish colonies

were not permitted to manufacture goods that would compete with products of the mother country. This short-sighted policy of Spain toward her colonies retarded colonial development for centuries.

Emigrants of Europe sought the temperate lands of North America. The United States and southern Canada were even more attractive than were the lands of temperate South America. The United States was close to Europe, it had fertile land, an abundance of timber for fuel, home-building, and the manufacturer of tools and implements. The eastern portion of the United States and of southern Canada possessed an abundance of game animals useful for their meat and furs. Then, too, even the most favored areas of temperate South America lacked a well-rounded supply of those minerals that are essential to great industrial development. In this respect, eastern United States was favored, as it is rich in such minerals.

These advantages of North America made it only natural that the industrial development of Middle-Latitude South America should proceed slowly. The rebellion of the various countries—Argentina, Uruguay, Paraguay, and Chile—which resulted in independence from Spain, opened the way for progress. It was not until after 1880, when the agricultural frontier of the United States was gradually disappearing, that the European emigrant turned enthusiastically to Middle-Latitude South America and especially to Argentina. (Graph below.) This movement to the Southern Hemisphere was hastened by the United States immigration laws, passed in order to limit the number and types of foreigners who could come to the United States. The introduction of refrigeration in Argentina and of refrigerator-ship service to Argentina about 1887 made it possible for the country to make better use of her pastoral products.



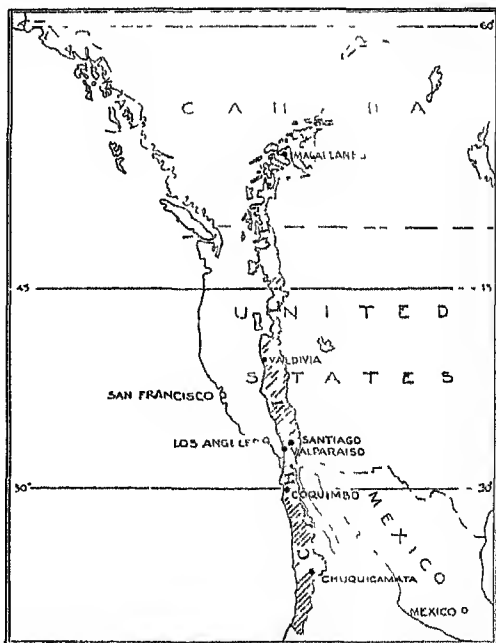
The major waves of immigration to Argentina came after 1885. By this time our own agricultural frontier was rapidly disappearing.

During recent decades immigration to temperate zone South America has increased, but the land does not attract many men of moderate means. Most of the land is held in vast estates of thousands or even millions of acres. For example, it has been estimated that only 5 per cent of the people of Argentina own land. In some sections of the country it is difficult to buy less than 500 to 1,000 acres of land. Thus, the average European emigrant of the home-loving type who would like to buy 40, 60, or 80 acres is not attracted to such areas. This system of holding land in large estates fosters class distinction. The few who own the land have large incomes; the masses who work the land have but little opportunity for economic advancement.

MODERN CHILE

A long, narrow country. Chile is a long, narrow strip of land sometimes called a shoestring country. It has a length of 2,600 miles, but its average width is but slightly more than 100 miles. If it were placed along the western coast of North America, it would extend from the cool, rain-soaked coast of southern Alaska to the desert lands of western Mexico, and even farther south to the latitude of Mexico City (Map at right). Part of the country, therefore, lies within the tropics.

An isolated country. Chile is separated from eastern South America by the most forbidding barrier of the New World—the Andes Mountains. Before the digging of the Panama Canal it was one of the most isolated coun-



Chile is a long narrow country with a variety of climates. It is shown here superimposed upon western United States, and placed upside down so that the latitudes may be compared.

tries in the world. It was not only remote from the industrial regions of western Europe and eastern United States, but the routes by which it would be reached were difficult and dangerous ones.

Prior to 1914 when the Panama Canal was opened, it was costly to ship goods from Chile to the industrial centers bordering the North Atlantic Ocean. The major trade route between the North Atlantic and Chile was by way of the treacherous water around Cape Horn, or through the difficult narrows of the Strait of Magellan. During the sailing-vessel days the Strait of Magellan was one of the most dangerous water passages in the world. The narrow channels, numerous rocks, heavy blankets of fog, and strong winds all worked together to cripple or destroy hundreds of fine ships.

In order to avoid the difficult and costly voyage around South America, goods destined for central Chile were sometimes sent by way of the Isthmus of Panama. Shipment by this route made it necessary to unload and reload the goods both on the Atlantic and on the Pacific sides of the Isthmus. Moreover, the land haul on the wet, hot, unhealthful Isthmus was difficult and expensive.

The opening of the Panama Canal has brought Chile into closer touch with the industrial world than before. Similarly, the building of trans-Andean railways has brought Chile closer to eastern South America. Yet transportation costs on this mountainous road with its frightfully steep grades are high. Ordinary agricultural products can scarcely stand such high-cost methods of shipment. The distance from Chile to the industrial centers of Europe and eastern United States are still great in spite of the Panama Canal. Consequently, Chile is still a relatively isolated country.

A country of diverse natural environments. Chile has the extremes of wet climates and dry climates. The southern part of the country is one of the wettest places in the world; the northern part contains the driest known desert. The southern third of the country is a heavily forested region that is too cloudy, rainy, drizzly, foggy, and cool for agriculture. The central third of the country has a climate very similar to that of California. This is the only part of the country well suited to agriculture. The northern third of Chile is largely desert and is of little value except for its minerals.

The topography of Chile also varies greatly from one region to another. In the extreme southern part of the country is situated the grass-covered plain which includes a large part of Tierra Del Fuego.

The southern portion of the mainland of Chile for a distance of nearly 700 miles is made up largely of heavily forested mountain slopes. The central part of Chile contains much rugged land, but it also contains low river valleys and low hill land suited for agriculture. Most of northern Chile is made up of mountains and plateaus.

Land is largely waste The foregoing discussion indicates that most of Chile is too wet, too dry, too cold, or too rugged for agricultural development. Less than two per cent of the land is at present in crops, and less than four per cent is suited for cultivation.

NATURAL REGIONS OF CHILE

South Chile—an area but slightly developed. Very few areas that lie within either of the temperate zones are of less value to man than that of the southern third of Chile (Region I, *Illus.*, p. 686). Large stretches of the land are entirely without population, and the remaining areas are but sparsely populated. The handicaps to development are numerous and difficult to overcome. The country is mountainous; the rainfall is exceedingly heavy and is accompanied with much cloudy and foggy weather; the soil is relatively infertile; and the native vegetation is of little value. Even the native animal life is scant and almost worthless.

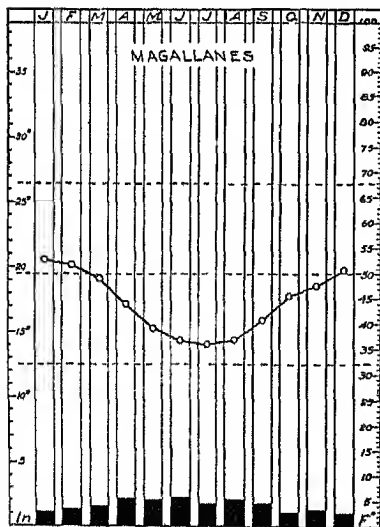
Silent forests. A stretch of more than 600 miles of land lying between Chile and the Strait of Magellan contains one of the most silent and yet one of the most beautiful forests of the world. Everywhere along the coast the rugged islands and bold headlands of the region are heavily forested. But one might travel scores of miles through this magnificent forest without hearing the sound of the woodman's axe, or the crack of the hunter's rifle. Only the moaning of the strong westerly winds, the pounding of the waves against some headlands, the patter of the rain, or perhaps the call of a bird breaks the silence of this dark forest. Large districts have never yet been explored.

The appearance of the forest is deceiving. Many of the trees are large and appear to be suited to valuable forest industries. Such however, is not the case. The largest of these stately trees are merely considered giant weeds of the forest. Their wood contains a high percentage of water. When one attempts to cure the lumber it cracks, splits, checks, and warps. If exposed to the weather, the wood soon decays. There are a few species of trees suited to the

production of high-grade lumber. They, however, are the exception to the rule.

Even where the timber is of good quality, the development of the lumbering industry is practically impossible because of the great expense involved in constructing roads and in providing other transportation facilities. Along the Strait of Magellan, where the land is less rugged than elsewhere, a few sawmills are operated. Most of the lumber sawed in this region is shipped to Argentina and Uruguay. While the prospects for the lumbering industry of this region are not bright, the wood-pulp industry may some day become important. At present, however, it is of little value.

Pasture On both sides of the Strait of Magellan are to be found considerable stretches of grass-covered plains. This region is almost constantly bathed by moisture-laden winds which blow directly from the Pacific Ocean. The winters are windy, moist, raw, and uncomfortable. The temperatures are relatively mild as indicated by the thermometer, but they seem cold to human beings (Graph below.) Winter temperatures seldom stay below freezing for any considerable length of time, and grass grows throughout the year. The summers are cool and moist. The hottest month has an average temperature of less than 53°F; whereas the coldest month has an average temperature of 36°F.



The temperatures of Magallanes are relatively mild.

These conditions are admirably suited to sheep-raising. Approximately 3,000,000 sheep graze in the open fields the year round. These sheep yield from six to eight pounds of wool per head annually, and the mutton produced in this region is of high quality. Thus wool and meat are among the major exports of the region.

The sheep ranches are large. Some of them contain more than 100,000 acres each, and it is a small ranch indeed that does not contain 5,000 acres. Such conditions indicate that the land is sparsely populated. These sheepherders and their families, many of whom

have come from Scotland, lead lonesome lives. Many of the children never attend school; churches are far apart, and the contacts with the outside world are few.

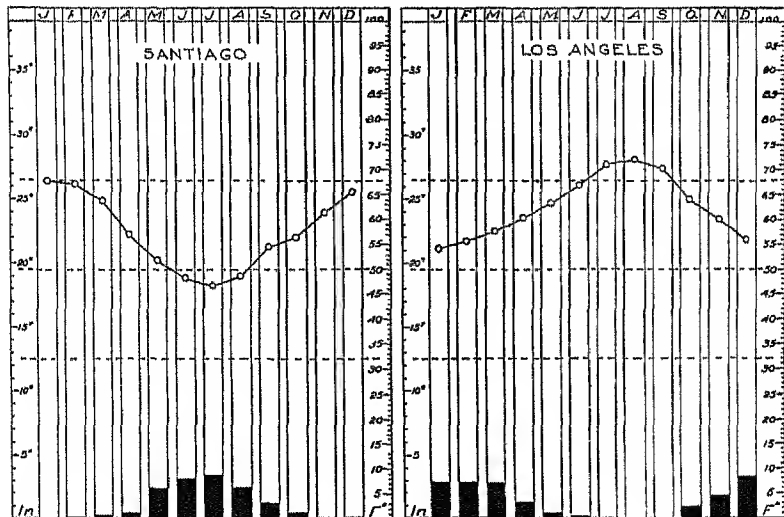
Central Chile—an agricultural region. Central Chile is practically the only part of the country that contains climates suited to agriculture. Unfortunately, most of the region, although climatically suited to agriculture, is too rugged for cultivation.

Climate and agriculture. The climates of central Chile are very similar to those of California. The southern part of the region, like that of northern California, is wet the year round. The rainfall is especially heavy during the winter months. The temperatures are always relatively mild. Such regions are especially well suited to forests, pasture, wheat crops, fruit culture, and vegetable production.

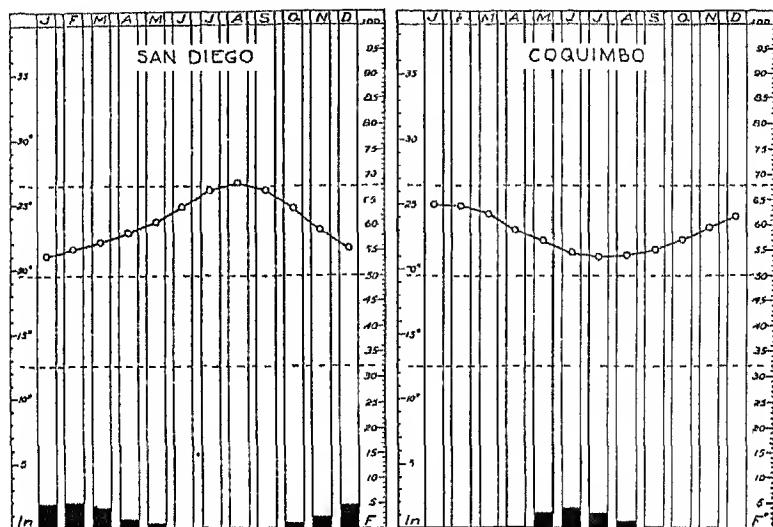
The climate of Santiago is similar to that of Los Angeles, California, as a comparison of the two graphs below will show. Such climates are well suited for Mediterranean crops, such as grapes, winter vegetables, fruits, barley, and wheat.

Farther north in Chile, near Coquimbo, the climate is similar to that of Lower California and drier than that of San Diego, California (Graphs, p. 698.) Crops grown in such climates must be irrigated.

Agriculture is carried on in many parts of central Chile. However,



The climate of Santiago is very similar to that of Los Angeles. Why do the charts appear so different?

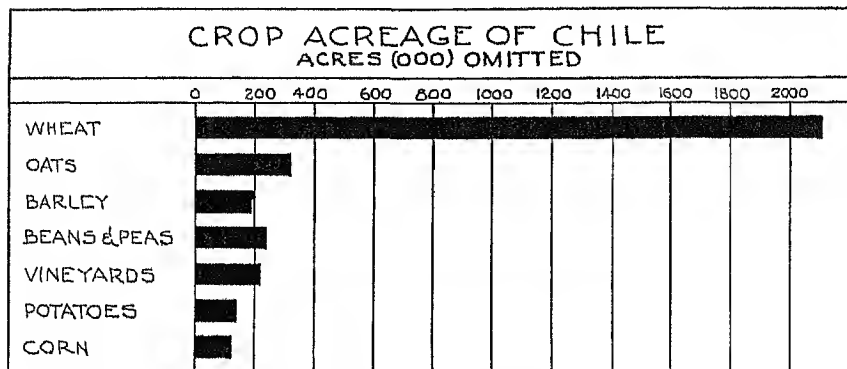


Coquimbo has a climate drier than that of San Diego, California

one region—the Central Valley—is the dominant agricultural area of the country. This valley is surrounded by mountains. The low range of coastal mountains lies on its west, whereas the Andes Mountains, soaring to altitudes of 20,000 feet, lie to the east. This Central Valley is a small area, 20 to 40 miles wide and 900 miles long; yet, in spite of its small size, it constitutes the chief agricultural area of the country. It has gently sloping topography, fertile soil, light to fair rainfall, and a healthful climate.

Subsistence agriculture. Because of centuries of isolation, central Chile has been forced to grow most of its own food. At the same time it has not been profitable to grow any considerable surplus for export. Therefore, central Chile grows food crops for home use, whereas the farmers of Los Angeles give most of their time to the growing of vegetables, fruits, nuts, and grapes for the great American market.

Wheat is the most important crop of this region. It occupies more land than is given to all other crops combined. Most of the wheat is consumed locally, but, in normal years a little of it is exported. The long, cool, moist winters are favorable for the growth of this crop, and the hot, dry summers are well suited to its harvest. Since wheat is primarily a subsistence crop in central Chile, there is no need for the use of large-scale machinery. Fields are small and machinery is crude and simple. Agricultural methods are backward. Despite the



Compare the crops of Chile with those of California (p. 95). Data for 1940.

poor methods of tillage, the yield of 25 to 30 bushels per acre is approximately twice the average acreage yield in the United States.

Other major crops, such as potatoes, peas, and beans, are staple foods for the masses of the people, and are grown primarily for home consumption. Barley is used chiefly in the manufacture of beer, and grapes in the manufacture of wine.

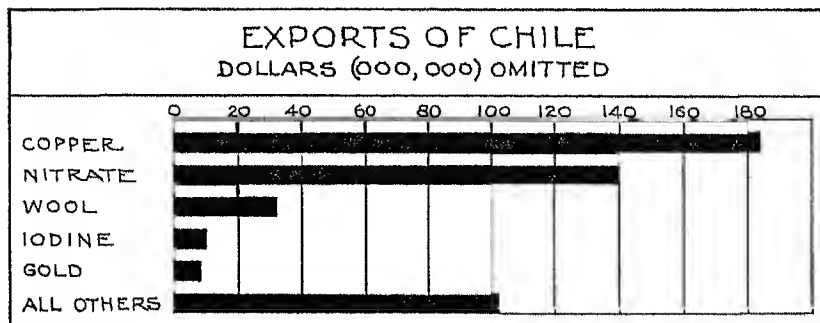


Central Chile is perhaps as well suited to grape culture as is central California. Irrigation water comes from neighboring mountains.

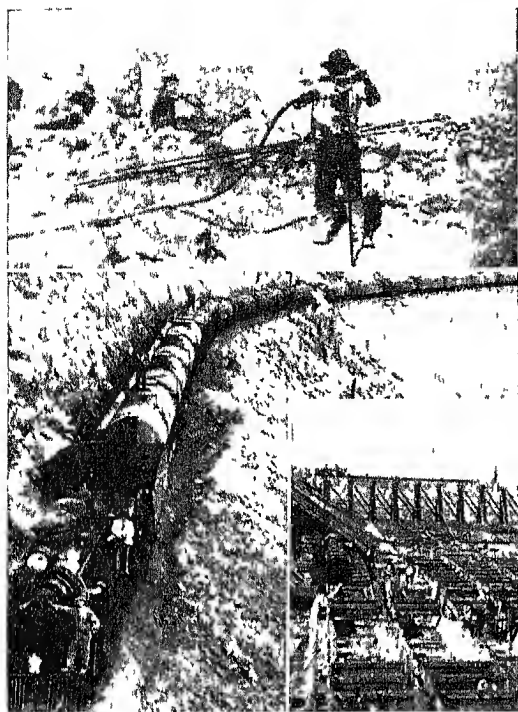
North Chile—a valuable desert. North Chile is perhaps the driest desert in the world, yet it is one of the most valuable stretches of desert land to be found anywhere. It produces annually a great wealth of mineral products—nitrate and copper—which account for most of the exports of the nation (Chart below.) The wealth of nitrate is probably a result of desert conditions. This valuable mineral is soluble, and the deposits would soon be dissolved and carried away if the land were humid. The nitrate-producing companies do not desire rain. Iquique, a bustling city of 50,000 people, at one time experienced a period of 19 years without rain, and yet the city prospered. Once, when a rainy season of several weeks was experienced, the nitrate companies suffered great financial losses, and the people found rain a great inconvenience.

The valuable nitrate deposits and vast copper ore deposits (the latter in no way a result of desert conditions) have made this desert a valuable stretch of land. The revenues which these minerals yield have helped Chile to attain a prominent position among the nations of South America. Chile found the desert so profitable that she resorted to war in order to win part of it. Moreover, she has indicated her willingness on several occasions to go to war again in order to retain it.

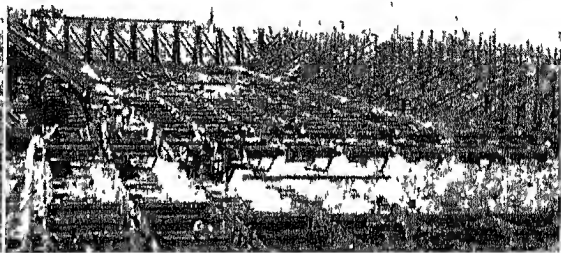
Population problems of the desert With severe aridity spread over the entire region, people cannot support themselves from the land. Indeed, few people would live here if it were not for the need of laborers to work in the mineral industries and to handle the import and export trade of land-locked Bolivia. Most of the people live, then, either in the mining centers or in seaports. Practically every neces-



Copper and nitrate, mineral products of northern Chile, represent the most valuable exports of the nation. Figures for 1934.

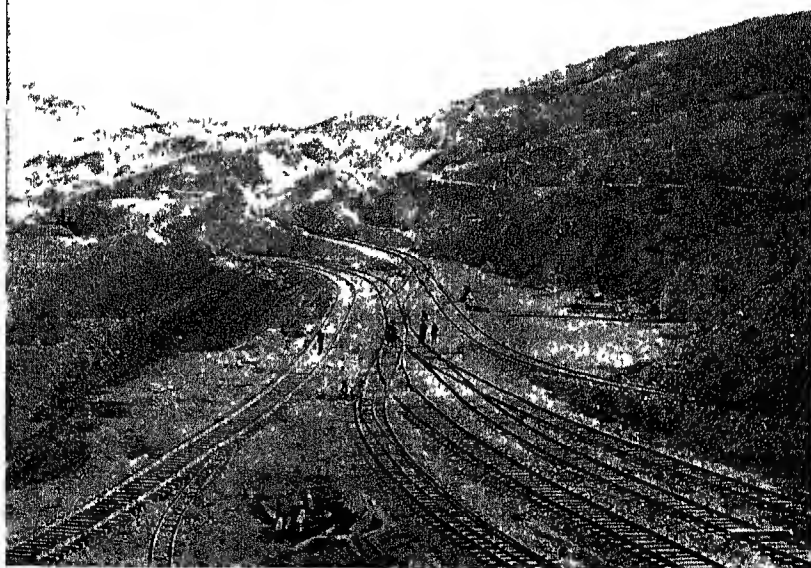
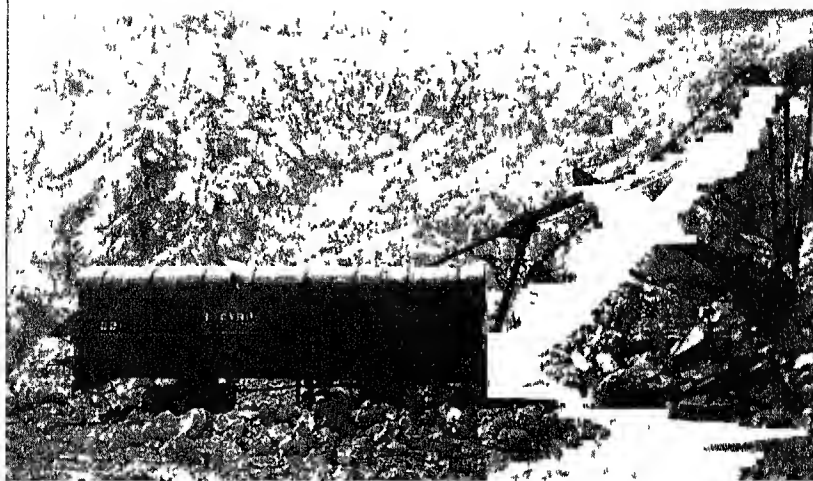


EXPLOITING THE NITRATE RESOURCES OF THE DESERT OF CHILE *Upper left*, breaking up the nitrate ore with a power drill. *Lower left*, transporting nitrate. *Lower right*, dissolving nitrate from the ore.



sity of life has to be shipped into the region. Water is piped into some cities, shipped in tank cars to others, and carried on the backs of animals to still others. A little of the food is grown in local oases, but most of the food and clothing must be imported. Of all of the necessities of life, houses alone are made of locally produced materials—primarily stone or adobe

Nitrate production. Mineral nitrate is used in the manufacture of commercial fertilizers, explosives, and in other chemical industries. For 85 years, 1830 to 1915, Chile was the major source of commercial nitrate. The growth of the nitrate industry was slow, but after 1880 the annual needs of the world were from 1,000,000 to slightly more than 2,000,000 tons annually. (Illus above.) The great demand for explosives during the World War caused production to leap to almost 3,000,000 tons a year. Following the war the demand for nitrate decreased. Moreover, scientists learned to produce synthetic nitrate economically. Thus at present the various industrial countries of the world are producing more than 10 times as much synthetic



The copper ores of Chuquicamata, which lie near the surface, are mined by steam shovel (*top*), and have good railroad connections with the coast (*bottom*). (Courtesy Pan-American Union.)

nitrate as is produced in Chile. Germany alone is now producing several times as much nitrate as is Chile. The nitrate industry of Chile is therefore less prosperous than formerly.

Other minerals. Chile possesses the largest known deposits of copper in the world. These are located in the highlands near Chuquicamata. Find Chuquicamata on the map (Illus., p. 693.) The copper ore is near the surface and is mined by blasting it from open-face surface mines. Chile also has valuable iron ore deposits, and it is the only country in South America that mines any considerable amount of coal. American copper and steel companies control most of the copper and iron ores of Chile, and most of the output of these two metals is shipped to the United States by way of the Panama Canal.

QUESTIONS AND EXERCISES

1. Did the Spanish settlers make the best use of their opportunities to develop Middle-Latitude South America? Explain.
2. What are the advantages of Middle-Latitude South America for development by European peoples?
3. What factors retarded the economic development of Middle-Latitude South America?
4. Compare and contrast the types of settlers that went to Middle-Latitude South America with the types that came to the United States.
5. Write a composition on one of the following subjects:
 - (1) Why I Should Like to Live in Patagonia.
 - (2) Why I Should Not Like to Live in Patagonia.
6. How did the opening of the Panama Canal affect the opportunities for trade in Middle-Latitude South America?
7. Compare and contrast geographic conditions of southern Chile with those of northern Chile.
8. Why is southern Chile backward?
9. What part of Chile is most highly developed economically? Why?
10. What are the major industries of northern Chile?
11. How have climatic conditions retarded development of northern Chile?
12. What are the important facts concerning the location of central Chile with respect to the rest of the world? In what respect has the relative location of Chile been changed during the last few decades? How?

- 13 Write a composition on one of the following subjects.
 - (1) The Difficulties of Mining in the Desert of Chile
 - (2) Social Conditions in the Desert of Chile
 - (3) Why I Should Like to Visit Chile
- 14 Why do agricultural conditions of central Chile differ markedly from the agricultural conditions of that portion of California that has the same type of climate?
15. What is the outlook for the development of forest industries of southern Chile?

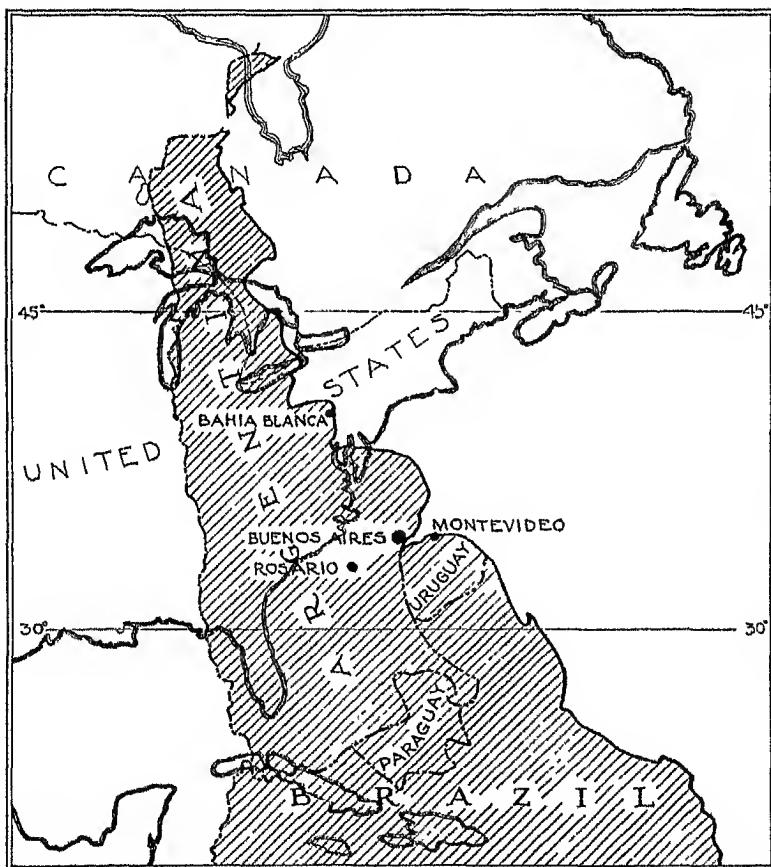
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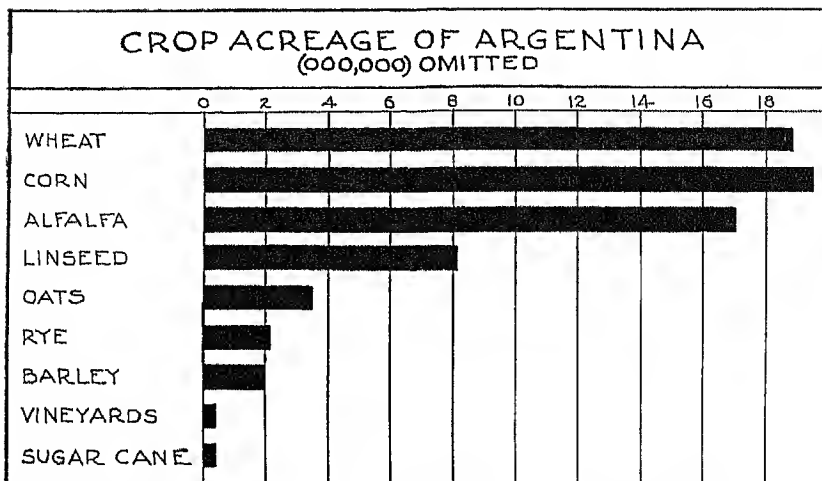
MIDDLE-LATITUDE SOUTH AMERICA (Continued)

MODERN ARGENTINA

A land of temperate climates. Most of Argentina lies within the temperate zone. If this Latin-American country were placed upon the continent of North America, keeping correct latitudes in



Argentina is a long country and possesses a variety of climates. It has the same latitude, except in a different hemisphere, as the region between Hudson Bay and Cuba. It is here shown superimposed upside down across part of eastern United States. Compare the latitudes.

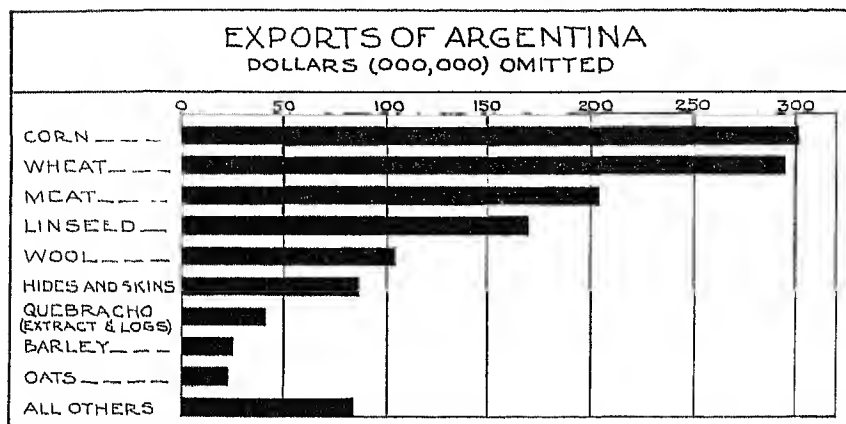


The major crops of Argentina are cereals, pasture crops, and flax for seed
Data for 1940

both cases, it would extend from Hudson Bay to Florida (Map, page 705) Thus the southern part of Argentina is cold, although not quite so cold as the area around Hudson Bay The northern part of the country possesses a climate even hotter than that of Cuba This condition results from the fact that Cuba is cooled by ocean breezes, whereas the northern part of Argentina lies within the hot interior of a large tropical land mass

A great agricultural and pastoral country. Argentina contains more than 1,000,000 square miles of land, and is approximately one-third as large as the United States. Like the United States, Argentina contains good agricultural land, semiarid districts, and regions that are near-desert. It possesses from one-third to one-fourth as much good agricultural and pastoral land as is contained within the United States. However, our agricultural resources are more fully developed than those of Argentina In fact, estimates indicate that Argentina has 200,000,000 acres of land suited to agriculture, but less than 70,000,000 acres have ever been given to crops.

An important exporter of pastoral and agricultural products. At present the population of Argentina is approximately 12,250,000, or less than one-tenth that of the United States. Thus the country is still sparsely populated. An abundance of productive land and a sparse population are factors that favor large exports of agricultural and pastoral products It is not surprising, therefore, to discover



Argentina is still sparsely populated and a large part of the agricultural and pastoral products are produced for export. Figures for 1934

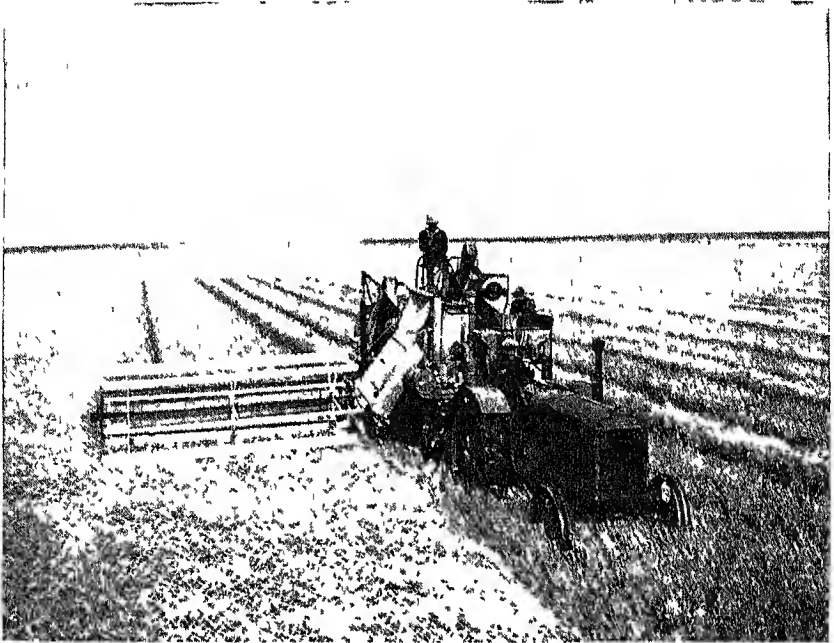
that Argentina is an important exporter of wheat, flax seed, corn, meat, hides, wool, and other agricultural and livestock products. Argentina ranks first among all countries of the world in the export of corn, linseed, and beef, and usually ranks second or third in the export of wheat, wool, and hides.

NATURAL REGIONS OF ARGENTINA

Area of diversified type of native vegetation and agriculture. Argentina's great variety of climates is conducive to an equally great variety of uses of the land. In a general way, the country may be divided into five natural regions whose boundaries are determined largely by differences in temperature and rainfall. These natural regions are: (1) the temperate and fairly well-watered Pampas; (2) the semitropical forests and grasslands situated in the northern part of the country; (3) the region of semiarid and near-desert lands lying between the Pampas and the Andes Mountains; (4) the bleak, treeless, wind-swept, semiarid lands of Patagonia; and (5) Mesopotamia.

THE PAMPAS REGION OF ARGENTINA

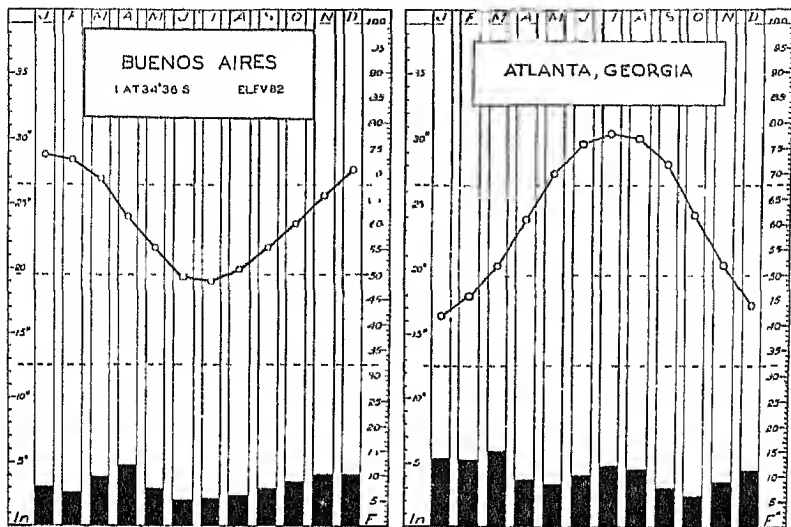
Pampa is an Indian word which means flat country. (Illus., p. 708) Most of the area designated as the Pampas of Argentina is an exceedingly flat plain which contains numerous shallow depressions. Indeed, most of these depressions are so shallow that they can



The picture illustrates why a large part of Argentina is called the *Pampas* (flat country). (Courtesy International Harvester Export Company)

scarcely be detected by the eye. (Natural region IV, illus., p. 686) During periods of heavy rainfall, however, it is observed that the water, instead of flowing off in streams, stands a few inches deep in these lower areas until it is absorbed by the porous soil. Within the western part of the Pampas, low rolling hills break the monotony of the landscape

A land of few streams. The Pampas is a land that contains but few rivers, and even creeks are not numerous. Only one river, the Rio Carcarana, flows from east to west across the plains. A few streams begin on the Pampas and flow but a few miles and then disappear as the water flows into one of the many depressions where it is soaked up by the pervious soil. As a result of the flatness of the surface, underground drainage predominates. This underground water is carried off so slowly that in many places the water table (permanent level at which the water stands) is only a few feet under the ground. Later we shall learn that this type of drainage bears a distinct relationship to agriculture, railroad building, and highway construction within large sections of the Pampas.

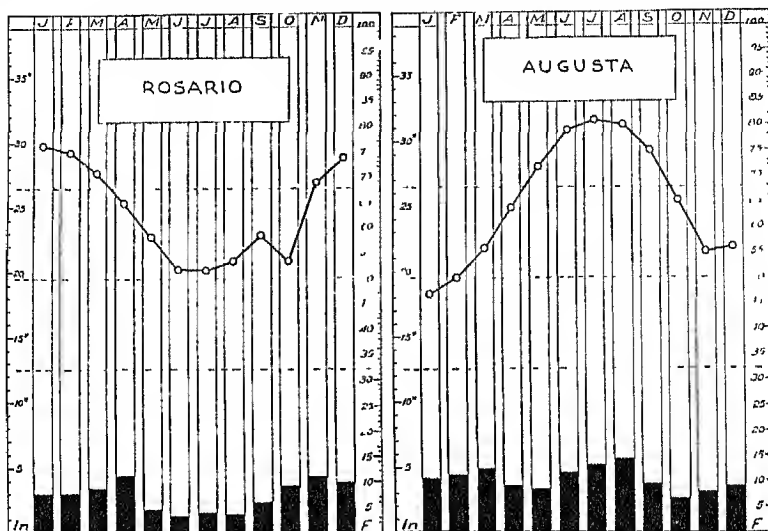


Buenos Aires has much the same climate as that of Atlanta, Georgia. Study these charts carefully and note differences and likenesses of the climates of these two cities.

Climate of the Pampas. This region lies in the Southern Hemisphere, and consequently January is the warmest month and July the coldest. The Pampas lies in the same latitudes as the area between the Ohio River and the Gulf of Mexico. Buenos Aires has the same average annual temperatures as Atlanta, Georgia. Study carefully the temperature curves of these two cities. (Graphs above.) Since Buenos Aires is on the coast the climate is modified by the sea. If you will study the two graphs above carefully, you will note the winters of Buenos Aires are warmer and the summers cooler than those of Atlanta, Georgia. The hottest month at Buenos Aires has a temperature of only 73.6°F., and the coldest month of 48.9°F.; whereas the hottest month in Atlanta has an average temperature of 78°F. and the coldest month of 44°F.

Bahia Blanca, situated near the southern margin of the Pampas, is but little colder than Buenos Aires. Rosario, situated inland and near the northern portion of the Pampas, has an average annual temperature approximately the same as that of Augusta, Georgia, although the seasonal temperature patterns are not the same.

Winters are relatively mild throughout the Pampas, and cattle and sheep can remain on pasture the year around. Snow seldom falls in any part of the Pampas except near the southern (poleward) mar-



Which has the colder winters, Rosario or Augusta, Maine? Which has the hotter summers? Which has the heavier summer rainfall? Which has the heavier winter rainfall?

gin. Snow flurries are a rare sight in Buenos Aires. In fact, vegetables may be grown in the vicinity of this great city throughout the year, and palm trees are listed among the outstanding features of the landscape. Of course frost kills the winter vegetables of Buenos Aires occasionally, just as it does the fruits and vegetables of most parts of Florida.

The average annual rainfall of the Pampas is 30 to 40 inches along the Atlantic coast, and decreases to the westward. Along the inland margin of the Pampas, approximately 400 miles west of Buenos Aires, it is 20 inches or even less. Throughout most parts of the Pampas, the rainfall is unreliable. Some years it is unusually heavy, other years it is abnormally light.

Native vegetation and its utilization. When the Pampas was first discovered it was covered with native grasses well suited to pastoral industries. Unfortunately, the few natives who lived in this great plain did not possess horses, cattle, sheep, goats, or other valuable domestic grazing animals. Consequently they could make but little use of the pasture.

When the Spanish explorers arrived in the Pampas, they quickly recognized the great potentialities of the pastoral industries. Much of Spain is a semiarid land that is better suited to pasture than to



Herd of pure-bred cattle fatten in the alfalfa fields of the Pampas Region of Argentina. (Courtesy Pan-American Union)

agriculture The early explorers were therefore well acquainted with pastoral industries. Very few of them had ever seen such fine pasture in their homeland as they found in the Pampas. Imagine their thoughts as they beheld the vast level plain covered with waving grass as far as the eye could see. For thousands of years this grassland had been awaiting the arrival of peoples who could make profitable use of it. At last they had come.

The Spaniards quickly introduced horses, cattle, and sheep into this vast South American plain. Since the climate is healthful for these animals they multiplied rapidly. At the same time the mild climate of this region made it possible for animals to graze on the open plains throughout the year. (Picture above) The horses, cattle, and sheep needed no expensive shelter to protect them from winter storms. The year round pastoral season made it unnecessary to produce crops for winter feeding.

The region was almost a pastoral paradise. The land was unused; the pasture was excellent; the climate was mild; and the region was not infested with any serious enemies, such as beasts of prey or deadly diseases. These conditions were almost ideal for the rapid multiplication of horses, cattle, and sheep. Accordingly, within a few decades, the Pampas was well stocked with these animals.

The cattle were valued chiefly for their hides, horns, and tallow. The meat was of poor quality, since the cattle were permitted to run wild and were fed only on native grasses. Moreover, this pastoral development occurred long before the day of refrigeration. Even a

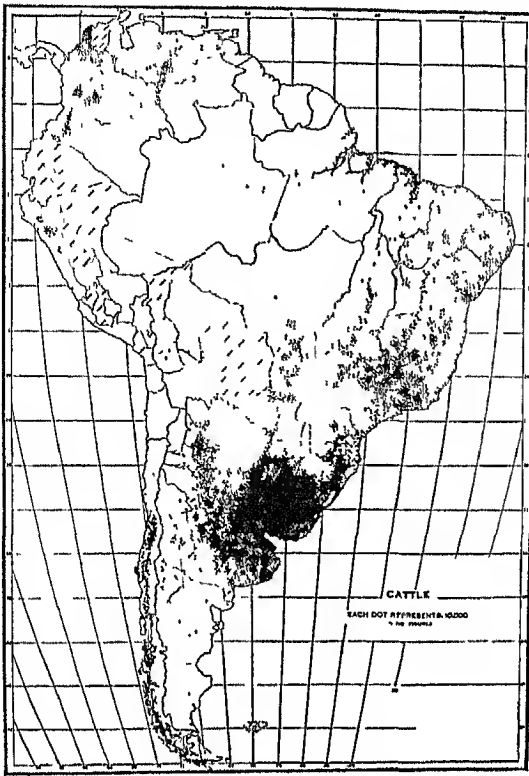
good grade of meat could not have been profitably shipped across the Andes Mountains, and then by way of the Pacific Ocean and the Isthmus of Panama to Europe. It will be remembered that for many decades after 1599, this was the only route which Argentina was permitted to use in exporting her products. It was not until 1790 that Buenos Aires was given the privilege of trading freely by way of the Atlantic Ocean. Even then she was permitted to trade only with Spain.

Thus, for nearly 200 years after cattle and sheep were brought to the Pampas, the principal exports of the region were hides, horns, and tallow shipped as contraband trade by way of the Atlantic to the countries of western Europe.

The *gauchos* (Spanish-Indian cowboys) with their fast ponies, ropes, and knives slaughtered the cattle with ease. They took only the hides, horns, and tallow, the meat was left on the plains to decay or to be devoured by vultures.

The most productive region of South America. The Pampas is a fertile area of about 250,000 square miles. It is a little smaller than the American Corn Belt and is approximately the size of the combined areas of Ohio, Indiana, Illinois, Missouri, and Iowa. This large, level plain is today the most productive agricultural and pastoral region of all South America. The agricultural industries have finally become more important than the pastoral industries. Yet the latter are still important. Indeed, the livestock products are more valuable today than they were when all of the land was still given to pasture.

The cattle industry of today. At present the Pampas of Argentina, together with Uruguay and southern Brazil, is the most important cattle region of all South America, and one of the most important of the entire world. (Map opposite.) The industry today contrasts sharply with that prior to 1880, when the demand for cattle products consisted primarily of hides, horns, tallow, and salted and dried meat. Gone are the days when practically all of the land remained unfenced, and when the *gauchos* led a nomadic life, followed the cattle wherever they roamed, and branded them to establish ownership. Today, practically all of the cattle are confined to great estates fenced with barbed wire. The gaucho, like the American cowboy, has practically disappeared. The breeds of cattle have been improved, and chilled beef has become the most valuable export, not only of the Pampas, but of all Argentina.



Southern Brazil, Uruguay, and the Pampas of Argentina are the important cattle-raising regions of South America today (Courtesy U. S. Dept. of Agriculture.)

Development of the beef industry. Factors contributing to the development of the beef industry of the Pampas include: (1) the improvement of the breeds of cattle; (2) the increasing demand for meat; (3) the improvement of transportation facilities. Many of the cattle of 1880 were descendants of the first herds turned loose on the plains nearly 300 years earlier. During this long period the cattle had been given but little care and, consequently, the stock had deteriorated. Most of the cattle were long-horned, raw-boned animals whose meat was tough at best. The importing countries of the world did not desire such meat. It therefore became necessary to improve the breeds of beef cattle if meat were to become an important export.

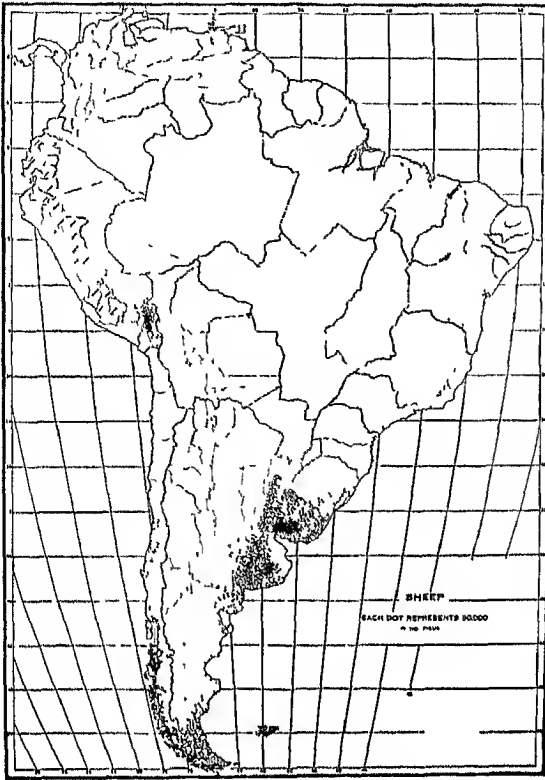
Improvement of cattle. Some of the more important factors in the improvement of the cattle were. (1) the importation of excellent breeds of cattle, (2) the provision for an ample supply of pure water, (3) the introduction of alfalfa, a forage crop that is superior to the native grasses; (4) the fencing of ranches so that the cattle could be given better care than was possible on the open range.

As previously stated, the native cattle were raw-boned animals that were poorly suited for the production of beef. To overcome this difficulty fine herds of Durham, Hereford, Aberdeen Angus, and other European cattle were imported for breeding purposes.

During the early centuries of the pastoral industry of the Pampas, the cattle suffered greatly for lack of an adequate water supply. It must be remembered that this great plain possesses but few permanent streams. Consequently, dry periods resulted not only in a failure of pasture but also in a shortage of water. Under such conditions, millions of animals died of starvation or of thirst. In order to overcome these disadvantages of the Pampas, thousands of wells were dug and windmills were erected to provide a constant supply of fresh, wholesome water; and alfalfa was introduced to insure a more nutritious and reliable pasture crop than was afforded by the native grasses.

Alfalfa and the cattle industry. Alfalfa is the most successful crop of the Pampas. This plant is capable of sending its roots down 5, 10, 15, or even 20 feet in search of water. Over large sections of the Pampas the permanent water table rises close to the surface. Consequently, alfalfa sends its roots down to this permanent supply of water and is scarcely injured by a drought of ordinary duration. The alfalfa grows more abundantly and is more nutritious than native grasses. Cattle that are pastured on alfalfa grow rapidly, become exceedingly fat, and their beef is of much better quality than that of cattle fed only on native grasses. Moreover, alfalfa roots gather nitrogen from the air and thereby enrich the soil. When used for pasture, alfalfa fields become increasingly fertile and the pasture improves. When the alfalfa is used for hay most of the fertilizer is returned to the soil.

Sheep. Sheep can exist for long periods without water. In places where the dew is heavy, sheep may be able to live for months on this supply of water alone. This characteristic of sheep, together with the fact that they can nip the grass close, makes them well suited to regions subject to drought. Moreover, wool is a relatively non-

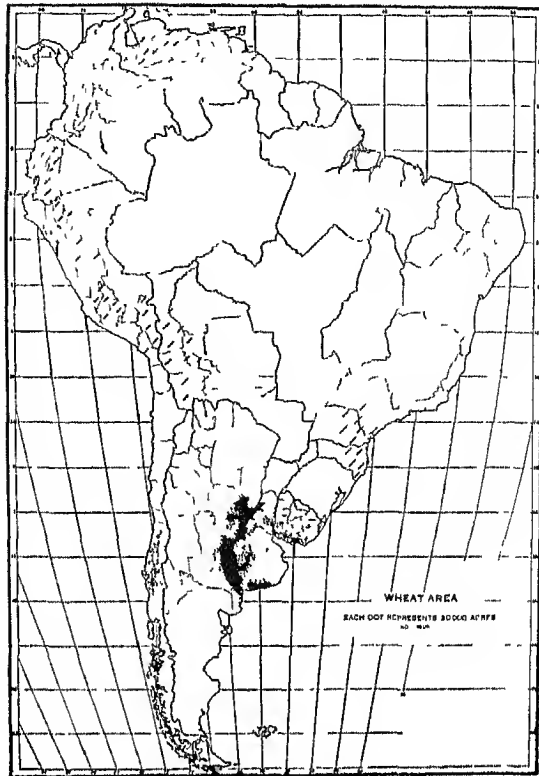


Distribution of sheep in South America. (Courtesy U. S. Dept. of Agriculture)

perishable product of high value and small bulk, and can stand slow and inexpensive methods of transportation. Under such conditions it is not surprising that in early days sheep were raised in large numbers on the Pampas. In 1890, before the introduction of wells, alfalfa, and diversified agriculture into this region, the single province of Buenos Aires supported more than 50,000,000 head of sheep.

Although the Pampas is still the most important sheep-raising portion of Argentina, the industry has been pushed back away from the well-watered coastal district.

Agriculture. The Pampas is not only an important pastoral region, but it is also an excellent agricultural area. The level topography, fertile soil, temperate climate, and fair water supply are all factors conducive to the development of agriculture. Although alfalfa,



The great wheat-producing area of South America is situated within the sub-humid and semi-arid parts of the Pampas Region. (Courtesy U. S. Dept. of Agriculture)

already discussed, is the most important crop, wheat, corn, flax, oats, barley, and rye are each fairly well suited to the climate of some part of this great plain.

Wheat. For the six-year period, 1931-1937, Argentina ranked sixth among the great wheat-producing nations of the world. (Illus , p. 141.) However, as an exporter of wheat and wheat products, Argentina usually ranks fourth. Practically all of the wheat is grown in a vast crescent-shaped area with a north-south extent of approximately 200 to 300 miles. (Map above.) This zone of extensive wheat cultivation lies within the drier parts of the Pampas, where the rainfall averages 16 to 20 inches in the west and 20 to 25 inches in the east.

This zone of wheat cultivation is still sparsely populated. As a result, despite the use of large-scale machinery, such as indicated in the illustration on page 708, many extra laborers are needed during the harvest and marketing season

Marketing wheat constitutes one of the major problems of many of the farmers. The region has no navigable streams, and surfaced highways are almost unknown throughout most parts of the crescent-shaped zone. A loose network of railroads has been constructed throughout the wheat belt, but many farms are 15, 20, or even 30 miles from a railroad station.

Much of the wheat has to be transported to market over poor roads. High-wheeled carts or wagons are commonly used for this purpose. These high wheels, some of which are eight feet in diameter, give extra leverage in pulling out of ruts that have been cut deep into the mud or dust

Corn production and utilization. The corn belt of Argentina is small, but it is one of the most intensive corn-growing regions in the world. Modern machinery is used on most of the farms. Yet it is not a region of large-scale farming, nor one in which large-scale machinery is extensively used. The horse still supplies most of the tractive power of this area, whereas the tractor is in very common use in the wheat belt (Compare the illustration on page 708 with those below and on the next page.)

Most of the corn crop of Argentina is grown within a small area of approximately 28,000 square miles. (Illus., p. 719) The importance



Preparing land for planting in the corn belt of Argentina. (Courtesy International Harvester Export Company.)



Plowing corn in the corn belt of Argentina. (Courtesy Pan-American Union.)

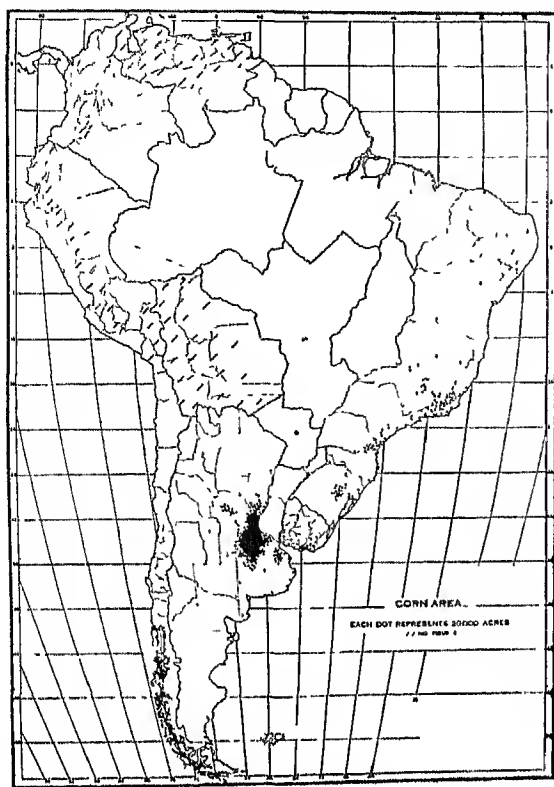
of corn within this region is indicated by comparing it with Iowa, the largest corn-producing state of the Union. The corn belt of Argentina is only one-half as large as Iowa, yet it normally produces more than one-half as much corn as is grown in the greatest corn-growing state of the Union.

Uncertainty of crop Although the average corn crop of Argentina is large, the acreage yield is uncertain. The farmer never knows what the crop will be until it has been harvested. Sometimes locusts destroy a large part of the crop; at other times the rainfall comes at the wrong season, and sometimes the hot, wet husking season causes the corn to rot in the field before it is harvested.

Uses of corn Argentina has never developed the hog industry to any considerable extent. Iowa alone normally fattens and markets more than three times as many hogs as are raised in all Argentina. Most of the cattle of Argentina are fattened on alfalfa rather than on corn. As human food, wheat is much more extensively used than corn. There is, as a result, no large local market for this cereal.

Fortunately, the corn belt lies close to the Parana River and has easy access to the Atlantic Ocean and to European markets. Since there is no large local market for corn, a large part of the crop is exported. Argentina has therefore become the largest corn exporter in the world. During years of good crops this cereal is the country's most bulky export.

Flax. The corn belt of Argentina is also the country's major flax-growing region. This crop is grown, not for its fiber, but for its seed



Corn is grown over a large section of Argentina. However, the true corn belt of the Pampas is represented by approximately thirty square miles. (Courtesy U. S. Dept. of Agriculture)

from which linseed oil is made. Argentina is by far the world's greatest linseed-producing country. The New World and many European countries look to Argentina for a large part of their supply of this particular raw material for the manufacture of paints.

THE MOUNTAINS AND THE SEMIARID AND ARID PLAINS OF ARGENTINA

The mountains are primarily of importance because of the fact that they are a great barrier separating eastern South America from the western part of the continent. They are of relatively little value to man except for (1) their limited mineral resources, (2) their poor pasture lands, and (3) irrigation waters for the eastern plains.

West of the Pampas, but extending beyond it both to the north and to the south, lies a belt of semiarid and desert land (Region VIII, illus., p. 686.) Most of this dry region has been given to the pasturing of sheep, but small districts have been irrigated and given to agriculture.

Tucuman—the garden spot of Argentina. The Tucuman District has the heaviest rainfall of this semiarid region. In fact, parts of this area have a relatively heavy rainfall and may be classified as humid. Yet many acres of such crops as sugar cane, rice, corn, alfalfa, fruits, and vegetables are irrigated. In other cases the crops are grown without the use of irrigation waters.

Sugar cane is the most important crop of the region. In years of good crops the region produces approximately 400,000 tons of sugar or more than 80 per cent of the country's needs. Unfortunately, bad years for the sugar-grower are not uncommon. Diseases, insect pests, droughts, or other adverse conditions often destroy the crop or greatly reduce the yield. Diversified agriculture is being practiced on an increasing scale in order to offset the dangers of a bad crop of sugar cane. The acreage of corn, alfalfa, rice, fruit and vegetables is gradually being increased.

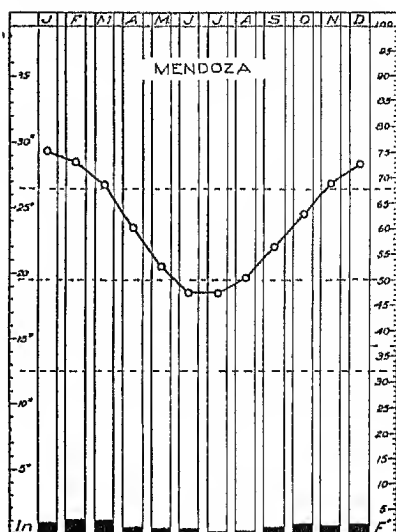
Just as sugar cane is the most important crop of the region, so sugar production is the most important manufacturing industry of the area. The completion of a railroad to Tucuman has provided transportation facilities for the importation of the necessary machinery for sugar refining. At the same time it permits the economic export of sugar.

Mendoza and grape culture. Five hundred to 600 miles south of Tucuman are situated several oases near the city of Mendoza. (Graph opposite.) These abundantly irrigated and intensively cultivated oases lie in a desert of bright sunshine throughout the year. The water for irrigation is derived largely from the melting snow of the Andes Mountains, which lie directly to the west. These oases are especially noted for the cultivation of grapes and the manufacture of wine.

In 1936 this region possessed approximately 300,000 acres of vineyards and has produced in recent years as much as 147,000,000 gallons of wine. In other words, this region produced the equivalent of approximately 60 gallons of wine for every family for the entire country.

The Mendoza District is today one of the most prosperous sections of Argentina. During the last few decades it has attracted

large numbers of Italian and Spanish emigrants. Upon their arrival within this zone of abundant sunshine, they found it similar in many respects to the drier parts of Spain and Italy. Many of the newcomers were already acquainted with the grape and wine industries. It was only natural that under such conditions they should engage in the same type of agriculture in the New World that they had left in the Old World. They found a ready market for their wines among the Latin peoples of South America and in the industrial countries of Europe. As a result the Mendoza Region has become the most important grape-growing and wine-



The rainfall of the Mendoza District is light, and irrigation is necessary for crop production

producing region of all South America. The wine production of Argentina is approximately twice that of Chile. The raisin and table-grape industries are also important in the Mendoza District. In fact, except for southern California, the area about Mendoza is the most important producer of table grapes, wine, and raisins to be found anywhere within the New World.

PATAGONIA

Patagonia is a bleak, treeless, windswept land which comprises about one-third of Argentina. (Region VII, illus., p 686.) Much of it is too dry for any use except as the driest kind of pasture, whereas other sections afford relatively good pasture. Very little of it is suited to agriculture. In the northern section most of the precipitation comes during the winter months, when it does the least good. During the summer, the land is so dry and thirsty that only a few animals can be supported to the square mile. In the southern section the maximum rainfall comes during the summer months and affords fair to excellent pasture.

Sheep-raising is the major activity of Patagonia. The cold, dry climate is well suited to fine breeds of sheep. The excellency of the fleeces of Patagonian sheep is indicated by the fact that although this region supports only one-fourth of the sheep of Argentina, it produces one-third to one-half of the wool of the country.

Isolation profoundly influences social conditions within Patagonia. The lonely shepherd's family has very few social contacts. The region has but few navigable rivers, no highway system worthy of the name, and but a short railway mileage. Good transportation systems are not needed, since sheep can walk long distances to market. Cities are few and small, since the sheep industry does not necessitate the building of large ones. Ushuaia, the largest city and the principal export center, is situated on the southern coast, 1,500 miles from Buenos Aires; and contacts with the outside world are infrequent. As a result of these conditions, Patagonia does not attract the well-to-do middle class of European emigrants.

THE GRAN CHACO

In northern Argentina and southern Paraguay is situated a large level tract of land covered with grass and open forest—the *Gran Chaco*. (Region VI, illus., p. 686.) This region is especially famed for its extensive forests, which consist largely of *quebracho* trees. *Quebracho* means "break ax," and the wood is exceptionally hard and resistant to decay.



A deposit of quebracho logs at a tanning factory of the Gran Chaco. (Courtesy Pan-American Union.)

The wood of the quebracho is used primarily for the manufacture of tannin extract used in the preservation of hides and skins and in the manufacture of leather. The wood is also valued for the manufacture of railway ties, fence posts, and lumber for cabinet-work and for general construction purposes.

The most valuable product of the Gran Chaco in recent years has been the tannin materials. The Chaco normally exports more than 250,000 tons of extract annually to the United States and to western Europe. This tannin industry is of relatively recent origin. (Illus., p. 722.) Formerly the wood was more extensively used for the manufacture of railroad ties. Quebracho is especially well suited to this use, because of the durable nature of the wood, and because of the proximity of this forest to the Pampas Region, where the greatest railway net exists.

MESOPOTAMIA

Mesopotamia (region V, illus., p. 686) is a poorly developed pastoral and diversified agricultural region. Cattle-raising is the most important industry. During recent years large maté (pronounced ma-tay) plantations have been developed near the Paraná River. The export of this South American tea now ranks second only to pastoral products among the exports of this region.

MANUFACTURING INDUSTRIES OF ARGENTINA

A land of meager mineral resources. Relatively few countries are as poverty stricken with regard to valuable minerals as Argentina. This large republic has no valuable resources of iron ore, coal, copper, lead, or zinc. Yet these five minerals are all basic to great industrial development. The country is also poor in petroleum, natural gas, and most other useful minerals except stone. Even high-grade stone is difficult to obtain in the Pampas, where it is most needed. The level topography and the scarcity of streams have left the most densely populated portion of the country with but little available water power.

This deficiency of valuable mineral and power resources has handicapped Argentina in her economic progress. Industries demand-

ing large quantities of fuel, metals, stone, and power have been slow in developing. The tall smokestack is not commonly seen in the country. Most iron and steel products are imported, farm machinery and industrial equipment are expensive. Even road-surfacing materials for the most populous parts of the country must be shipped long distances. As a result, surfaced highways are expensive, and construction of good roads has been retarded. The Pampas has a better system of railroads than of highways.

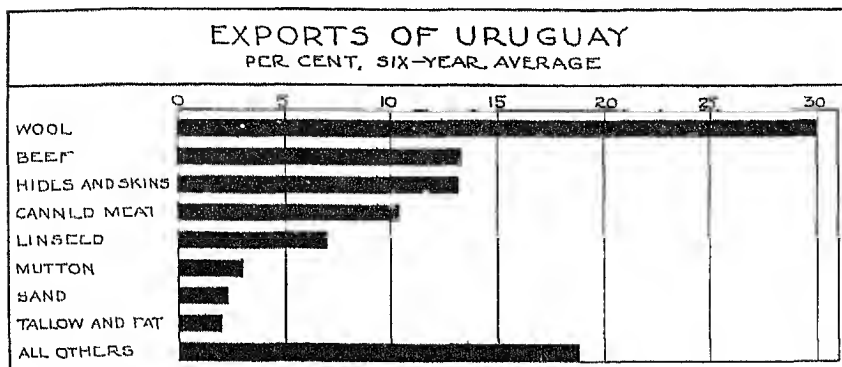
Agriculture and manufacture. The major manufacturing industries of Argentina have been developed around the agricultural products of the nation. Thus meat-packing plants, sugar mills, textile factories, tannin-extract plants, boot and shoe factories, and wine presses are representative of the important manufacturing industries of the country. The single major exception is the refining of petroleum and the manufacture of petroleum products.

The packing industry leads all others in point of value. In prosperous years the packing plants handle more than 6,000,000 cattle, 7,000,000 sheep and 1,500,000 hogs. Next in importance is the flour-milling industry. In a recent year the flour mills of the country ground almost 100,000,000 bushels of wheat. A further study of manufacturing indicates that practically all of the factories are dependent upon the soil for their major raw materials. Moreover, the amount of fuel and power used in most of the factories is small compared with the value of their product. Thus we find that Argentina has succeeded fairly well in adjusting her manufacturing industries to her raw materials.

URUGUAY

Uruguay is the smallest of the South American countries and one of the most sparsely populated. It is about the size of Oklahoma but has a somewhat smaller population. This tiny republic lies between latitudes 35° 3' and 30° South, with a climate which borders on both the tropical and temperate. The winters are mild and the summers hot except along the southern coast, where refreshing breezes from the sea cool the land.

A land of pastoral industry. No other country in the world is so completely given to pasture as is Uruguay. Many factors combine to favor such uses of the land. The native grasses are nutritious;



Most of the exports of Uruguay are products of livestock industries

the climate is mild, permitting year-round grazing, and no expensive shelter is needed to protect animals from the weather. Furthermore, for centuries pastoral products were the only ones that could be profitably exported. Such a long period of ranching has caused the industry to become a tradition. The large estates, sparse population, preference of the men for the saddle rather than the plow, and the profits of the livestock industries have all worked together to give emphasis to the pastoral industries.

In 1935 the livestock industry furnished more than 75 per cent of the total exports of the country. Formerly the percentage was much higher. The importance of pastoral products among the exports is clearly shown in the diagram at the top. Among the nine most important exports, all but two, linseed and sand, are pastoral products.

Agriculture. Approximately 7 per cent of the land is used for agricultural purposes. The most important crops are wheat, corn, linseed, oats, and rice. All of these crops except linseed are used primarily for home consumption. Wine production is becoming an important industry in the southern part of the country.

PARAGUAY

Paraguay proper embraces about 61,000 square miles, or an area one and one-half times the size of Ohio. An area of about 100,000 square miles, lying between the Paraguay and the Pilcomayo rivers, known as the Chaco, is claimed by Paraguay. However, her rights

to this land are disputed by Bolivia. Paraguay is a backward, inland country with the sparsest population of all the South American republics. It has less than a million people, the greater part of whom are Indians and Mestizos.

A land of diversified products. Paraguay is suited climatically for the production of oranges, tangerines, rice, tobacco, cotton, bananas, tea, and a variety of other commercial and subsistence crops. Corn and cassava are staple articles of diet and are grown in all inhabited areas. The major commercial products at present are quebracho, maté, and pastoral products. Thus it may be seen that the natural forests and native grasses still support the major commercial industries. However, the country has possibilities for considerable expansion of commercial development.

Forest products. Paraguay is especially noted for its forests of quebracho and maté (South American tea). The quebracho industry of Paraguay is much the same as that of Argentina (See p. 722). Maté is made from the leaves of a tree which is native to Paraguay and southern Brazil. Large plantations of maté have recently been developed in northern Argentina. When properly cured over the fire, its leaves make a tea that is widely used in Paraguay, southern Brazil, Uruguay, and Argentina.

Formerly maté was gathered by Indians from trees growing wild in the forests. These Indians frequently broke off the larger branches and cut down the smaller trees in order to pick the leaves. Such destructive methods resulted in a threatened shortage of the product. As a result large corporations have now begun the development of maté plantations. The largest of these plantations are situated in northeastern Argentina rather than in Paraguay.

QUESTIONS AND EXERCISES

1. Compare the climates of various parts of Argentina with the climates of the various parts of the United States.
2. What factors have aided Argentina to become a large exporter of agricultural exports?
3. If you were going to live in Argentina, what part of the country would you like best for a home? Why?
4. Which one of the five natural regions of Argentina has the best advantages of industrial development? Why?
5. What are the major characteristics of the Pampas of Argentina?

6. What are the major industries of the Pampas?
7. What types of manufacturing have been most highly developed within the Pampas Region? Why?
8. What are the major industries of the Gran Chaco?
9. Contrast social conditions of Patagonia with those of the Pampas
10. What natural and cultural factors favor the production of alfalfa in Argentina?
11. What are the major problems of the corn belt farmer of Argentina?
12. Compare and contrast the uses of corn in Argentina with its uses in Iowa. Why the differences?
13. What are the major problems of the farmers in the Mendoza Region? Would you like to live in this region? Why?
14. What are the influences of the natural environment of Argentina upon its manufacturing industries?
15. Discuss the advantages and disadvantages of Argentina for the construction of railroads and highways
16. What are some of the major industries of South American countries? (Read Whitbeck, R. H., and Thomas, Olive J., *The Geographic Factor*, pp 388-401)

FURTHER READINGS

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REFERENCE TABLES

I. AREA AND POPULATION

NOTE.—Density is computed on basis of latest population figures even when these are estimates. Asterisk (*) indicates the capital of the country. The world totals are published by the League of Nations. (From Foreign Commerce Yearbook.)

Country	Area, square miles	Latest census		Official estimates		Largest city	Estimated population (thousands)
		Year	Population (thousands)	Year	Population (thousands)		
Total, world.....	51,177,000			1937	2,115,800		
NORTH AMERICA							
United States (continental).....	3,088,510	1910	131,000			New York.....	7,380
Per cent of world total.....	5.1		6.2				
Alaska.....	580,400		72			*Juneau.....	5
Hawaii.....	6,407		423			*Honolulu.....	179
Canada.....	3,406,793	1931	10,377	1937	11,120	Montreal.....	810
Newfoundland and Labrador.....	152,734	1935	290			*St. John's.....	55
Mexico.....	700,290	1930	10,553	1937	19,151	*Mexico, D. F.....	1,029
CENTRAL AMERICA							
British Honduras.....	8,598	1931	51	1936	56	*Belize.....	17
Costa Rica.....	28,000	1927	472	1936	540	*San José.....	64
Guatemala.....	42,361	1927	2,005	1937	3,008	*Guatemala.....	107
Honduras.....	49,250	1935	962			*Tegucigalpa.....	43
Nicaragua.....	49,500	1920	638	1938	1,000	*Managua.....	115
Panama.....	32,380	1930	197	1936	535	*Panama.....	83
El Salvador.....	13,176	1933	1,560	1936	1,632	*San Salvador.....	99
WEST INDIES							
Cuba.....	44,104	1931	3,002	1936	4,109	*Havana.....	552
Dominican Republic.....	10,312	1935	1,478	1937	1,581	*Ciudad Trujillo.....	71
Haiti.....	10,201	1918	1,031	1937	2,700	*Port-au-Prince.....	105
Puerto Rico.....	3,435	1935	1,724	1938	1,806	*San Juan.....	137
Bermuda.....	19	1931	28	1937	32	*Hamilton.....	4
British West Indies.....	12,611	1931	2,023	1937	2,201	*Kingston (and suburbs).....	141
French West Indies.....	1,111	1939	551			Fort-de-France.....	48
Curacao (Netherlands West Indies).....	403			1930	91	*Willemstad.....	28
SOUTH AMERICA							
Guiana, British.....	80,480	1931	318	1930	333	*Georgetown.....	69
Guiana, French.....	35,100	1939	37			*Cayenne.....	11
Surinam (Netherlands Guiana).....	64,305			1939	169	*Paramaribo.....	53
Colombia.....	148,741	1928	7,851	1930	8,695	*Bogotá.....	340
Venezuela.....	362,141	1936	3,428			*Caracas.....	203
Argentina.....	1,076,960	1914	7,885	1937	12,762	*Buenos Aires.....	2,318
Brazil.....	3,286,170	1920	30,636	1937	43,247	*Rio de Janeiro.....	1,802
Paraguay.....	170,000	1899	650		900	*Asunción.....	95
Uruguay.....	71,172	1908	1,043	1937	2,093	*Montevideo.....	693
Bolivia.....	506,793	1900	1,797	1937	3,283	La Paz.....	202
Chile.....	289,306	1930	4,287	1937	4,597	*Santiago.....	600
Ecuador.....	279,007			1937	2,757	Guayaquil.....	140
Peru.....	482,258	1879	2,099	1930	6,500	*Lima (and suburbs).....	235
EUROPE							
Sweden.....	168,304	1937	6,285			*Stockholm.....	557
Norway.....	119,148	1930	2,814	1937	2,907	*Oslo.....	253
Denmark.....	10,575	1935	3,709	1937	3,764	*Copenhagen (København).....	843
United Kingdom.....	94,281	1931	49,189	1935	47,029	*London (Greater).....	8,203
Ireland (formerly Irish Free State).....	29,001	1936	2,900			*Dublin (Baile Átha Cliath).....	468
Belgium.....	11,754	1930	8,092	1937	8,361	*Brussels (Bruxelles).....	910
Luxembourg.....	999	1935	207	1937	298	*Luxembourg.....	68
France.....	212,722	1930	41,900			*Paris (and suburbs).....	4,963
Netherlands.....	13,515	1930	7,936	1938	8,035	*Amsterdam.....	788
Austria.....	39,377	1934	0,790			*Vienna (Wien).....	1,874
Czechoslovakia.....	64,244	1930	11,780	1937	15,293	*Prague (Praha).....	902
Hungary.....	38,030	1930	8,688	1937	9,035	*Budapest.....	1,059
Germany.....	181,743	1933	60,029	1936	67,587	*Berlin.....	4,251

I. AREA AND POPULATION (Cont.)

Country	Area, square miles	Latest census		Official estimates		Largest city	Esti- mated popu- lation (thou- sands)
		Year	Popula- tion (thou- sands)	Year	Popula- tion (thou- sands)		
EUROPE—continued							
Switzerland.....	15,944	1930	4,066	1937	4,174	Zürich.....	321
Estonia.....	18,159	1934	1,126	1938	1,131	*Tallinn (Reval).....	110
Finland.....	134,547	1930	3,667	1930	3,807	*Helsinki (Helsingfors).....	281
Latvia.....	25,402	1935	1,951	1937	1,965	*Riga.....	385
Lithuania (including Klaipėda district).....	21,471	1923	2,170	1938	2,550	*Kaunas (Kovno).....	103
Poland.....	149,057	1931	32,133	1938	34,600	*Warsaw (Warszawa).....	1,261
U S S R.....	8,176,051	1933	105,748	1934	170,500	*Moscow (Moskva).....	3,042
Italy.....	119,761	1936	42,445	1938	43,786	*Rome (Roma).....	1,251
Portugal (including Azores and Madona).....	35,582	1930	0,820	1936	7,275	*Lisbon (Lisboa).....	650
Spain (including Canary Islands).....	195,258	1930	23,561	1935	21,849	Barcelona.....	1,001
Bulgaria.....	39,825	1931	6,078	1938	0,280	*Sofia (Sofiya).....	359
Greece.....	60,270	1928	6,205	1937	7,000	*Athens.....	491
Rumania.....	113,887	1930	17,889	1937	19,040	*Bucharest (Bucarest).....	643
Yugoslavia.....	95,576	1931	13,634	1937	15,400	*Belgrade (Beograd).....	242
ASIA							
Arabia.....	1,000,000	-----	-----	1933	7,000	Mecca.....	85
Iran (Persia).....	628,000	-----	-----	1936	12,000	*Tehran.....	310
Iraq.....	175,004	1934	3,561	-----	-----	*Baghdad.....	300
Palestine.....	8,800	1931	1,030	1937	1,402	Tel-Aviv.....	141
Afghanistan.....	251,000	-----	-----	-----	7,000	*Kabul.....	80
Nepal.....	51,000	-----	-----	-----	5,600	*Katmandu.....	80
Syria and Lebanon.....	70,000	-----	-----	-----	3,250	Aleppo.....	250
Turkey (including Eu- ropean).....	294,402	1935	16,201	-----	-----	Istanbul.....	741
India.....	1,875,307	1931	338,171	-----	-----	-----	-----
British Provinces.....	862,790	1931	250,860	-----	-----	Calcutta (and sub- urbs).....	1,119
Indian States.....	712,508	1931	81,311	-----	-----	*Hyderabad.....	346
Burma.....	293,492	1931	11,607	-----	-----	*Rangoon.....	309
Malaya, British.....	53,243	1931	1,351	1937	5,137	*Singapore.....	440
Ceylon.....	25,142	1931	5,113	1937	5,780	*Colombo.....	315
Netherlands Indies.....	736,268	1930	60,727	1935	01,450	*Batavia (including Meester Cornelis).....	533
Indo-China, French.....	284,900	1930	24,030	-----	-----	*Saigon and Cholon.....	250
Philippine Islands.....	114,400	1918	16,315	1935	13,000	*Manila.....	353
Thailand (Siam).....	206,148	1937	14,464	-----	-----	*Bangkok.....	886
China (Dormition).....	4,600,000	-----	-----	1937	406,750	Shanghai (and sub- urbs).....	3,400
Hong Kong.....	361	1931	841	1936	088	*Victoria.....	378
Japan, Empire.....	260,758	1935	97,698	-----	-----	-----	-----
Japan Proper.....	147,701	1935	66,251	1937	71,253	*Tokyo.....	0,274
Chosen (Korea).....	85,239	1935	22,800	-----	-----	*Kaijo (Seoul).....	322
Taiwan.....	13,885	1935	5,212	-----	-----	*Tainan.....	100
AFRICA							
Algeria.....	851,300	1936	7,235	-----	-----	*Algiers (Alger).....	264
Tunisia.....	60,200	1936	2,608	-----	-----	*Tunis.....	220
Libya.....	677,000	1930	889	-----	-----	*Tripoli.....	99
Egypt.....	386,000	1937	15,005	-----	-----	*Cairo.....	1,307
Morocco, French.....	154,010	1936	6,200	-----	-----	Casablanca.....	257
Ethiopia (Abyssinia).....	400,000	-----	-----	-----	6,000	*Addis Ababa.....	187
Eritrea.....	85,000	1931	061	1930	1,000	*Asmara.....	10
Italian Somaliland.....	270,000	1931	1,022	1936	1,306	*Mogadiscio.....	30
Anglo-Egyptian Sudan.....	900,600	-----	-----	1936	5,950	Omdurman.....	111
French West Africa.....	1,815,000	1930	14,702	-----	-----	*Dakar.....	93
Liberia.....	48,060	-----	-----	-----	2,000	*Monrovia.....	10
Gold Coast.....	78,802	1931	2,876	1936	3,200	*Accra.....	71
Sierra Leone (including protectorate).....	27,025	1931	1,768	1935	1,800	*Freetown.....	62
Gambia (including pro- tectorate).....	4,068	1931	200	-----	-----	*Bathurst.....	14
Nigeria.....	738,593	1931	19,131	1936	10,365	Ibadan.....	387
French Equatorial Africa.....	960,000	1930	3,423	-----	-----	*Brazzaville.....	47
Uganda.....	80,688	1931	3,552	1936	3,087	Kampala.....	6
Kenya.....	216,780	1931	3,041	1936	3,262	Mombasa.....	43
Belgian Congo.....	902,000	-----	-----	1937	10,067	*Leopoldville.....	33

I. AREA AND POPULATION (Cont.)

Country	Area, square miles	Latest census		Official estimates		Largest city	Esti- mated popu- lation (thou- sands)
		Year	Popu- lation (thou- sands)	Year	Popu- lation (thou- sands)		
AFRICA - continued							
Tanganyika.....	366,632	1931	5,061	1936	5,147	*Dar es Salaam.....	23
Angola (Portuguese West Africa).....	481,350			1933	3,008	S Paulo do Luanda..	18
Rhodesia, Northern..	287,950	1931	1,315	1935	1,378	Broken Hill.....	33
Rhodesia, Southern..	150,351	1931	1,109	1935	1,289	*Salisbury.....	
Mozambique (Portu- guese East Africa)...	297,731	1930	3,906	1937	4,006	*Lourenço Marques..	43
Madagascar (including dependencies).....	238,000	1936	3,798			*Tananarivo.....	105
Union of South Africa..	472,550	1936	6,589	1937	9,797	Johannesburg.....	519
OCEANIA							
Australia.....	2,971,581	1933	6,631	1937	6,867	Sydney.....	1,279
New Zealand.....	103,931	1936	1,574	1937	1,602	Auckland (and sub- urbs).....	212

II. POPULATION

Principal Countries According to Occupational Groups (Thousands)

NOTE.—The figures all relate, except as indicated, to a post-war year, censuses ranging in date from 1919 to 1931. Where more recent data are available, the year is indicated in parentheses. The variation in date has no great effect on the distribution. The classifications of different countries are not always closely comparable. Percentages relate to both sexes combined. (U. S. Dept. of Commerce Yearbook, 1936)

Country	Total gainfully employed per- sons	Agricul- ture, etc. ¹	Mining and quarry- ing	Manu- fac- tures, handi- crafts	Trade	Trans- porta- tion and com- muni- cation ²	Profes- sions	Domes- tic and personal services	All other ³
AMERICA									
United States (1930)									
Workers.....	48,629.0	10,722.5	981.3	14,116.6	6,448.1	3,843.1	3,253.9	4,585.8	4,881.5
Percent.....	100.0	22.0	2.0	28.9	13.2	7.9	6.7	9.4	6.9
Canada (1931)									
Workers.....	3,921.5	1,220.7	58.0	678.3	423.4	265.9	218.9	316.7	709.1
Percent.....	100.0	31.1	1.5	17.3	10.8	6.8	5.6	8.1	18.1
Cuba									
Workers.....	948.9	161.1	1.4	189.6	147.6		22.6	98.1	27.0
Percent.....	100.0	48.6	.1	20.0	17.3		2.4	10.4	1.2
Argentina ⁴									
Workers.....	3,162.1	529.9	1.4	838.8	293.6	110.7	137.7	218.6	1,030.7
Percent.....	100.0	16.8	-----	26.0	9.3	3.5	4.4	6.9	32.5
Chile ⁵									
Workers.....	1,314.1	492.4	56.0	362.2	119.0	64.0	36.5	132.9	115.8
Percent.....	100.0	36.6	4.2	24.3	8.9	4.8	2.7	9.9	8.6
EUROPE									
Austria:									
Workers.....	3,084.0	981.0	1,025.9		375.2		80.0	-----	618.9
Percent.....	100.0	31.9	33.3		12.2		2.6	-----	20.6
Belgium ⁶									
Workers.....	3,205.2	613.0	212.8	1,278.5	314.1	244.1	116.0	100.1	246.0
Percent.....	100.0	19.1	6.6	39.9	10.7	7.6	3.6	5.0	7.5
Bulgaria ⁷									
Workers.....	2,000.3	2,113.0	5.0	201.5	99.7	34.0	43.7	18.8	81.0
Percent.....	100.0	82.4	.2	7.9	2.7	1.3	1.7	.7	3.1
Czechoslovakia ⁸									
Workers.....	6,014.4	2,524.0	159.7	2,052.7	301.6	242.0	166.5	260.0	345.4
Percent.....	100.0	40.8	2.7	34.1	6.0	4.0	2.8	4.3	5.8

II POPULATION (Cont)

Country	Total gainfully employed per- sons	Agricul- ture, etc. ¹	Mining and quarry- ing	Manu- fac- tures, handi- crafts	Trade	Trans- porta- tion and com- muni- cation	Profes- sions	Domestic and personal services	All other ³
EUROPE—continued									
Denmark									
Workers	1,361.8	471.6	-----	167.9	148.9	80.1	75.9	180.0	36.1
Percent	100.0	11.8	-----	27.0	10.8	5.9	5.5	13.3	2.7
Finland									
Workers	1,498.0	1,032.3	5	191.5	50.1	39.8	25.6	36.2	128.9
Percent	190.0	68.9	-----	12.8	3.3	2.7	1.7	2.0	8.6
France									
Workers	21,394.1	8,190.0	411.0	6,686.8	2,418.7	(⁶)	(⁶)	816.6	2,784.1
Percent	100.0	38.3	2.0	31.2	11.4	-----	-----	4.9	13.0
Germany (1933)									
Workers	32,299.5	9,343.5	1,307.9	11,743.0	4,370.4	1,551.9	2,701.3	1,269.6	-----
Percent	100.0	28.6	4.1	36.3	13.6	4.8	8.4	3.9	-----
Hungary									
Workers	3,653.8	2,126.7	40.1	676.7	183.7	117.6	-----	155.6	350.1
Percent	190.0	58.2	1.1	18.6	5.0	3.2	-----	4.3	9.6
Italy (1931)									
Workers	17,262.5	8,168.6	120.7	4,073.6	1,421.0	704.7	574.9	673.4	532.4
Percent	100.0	47.3	7	28.8	8.3	4.6	3.3	3.6	3.1
Netherlands (1930)									
Workers	3,185.8	655.2	51.4	1,163.6	503.1	216.6	215.2	264.4	92.0
Percent	100.0	20.6	1.6	36.5	15.8	7.6	6.7	8.3	2.9
Norway									
Workers	1,070.4	393.8	16.0	293.5	116.1	61.8	37.2	97.1	21.0
Percent	100.0	36.8	1.5	27.4	11.1	5.6	3.5	6.1	2.0
Poland ⁴									
Workers	13,523.2	10,266.6	63.1	1,173.2	518.8	243.9	212.7	275.7	735.9
Percent	100.0	75.9	.7	8.7	3.8	1.8	1.6	2.9	5.5
Portugal ⁴									
Workers	2,515.0	1,161.8	0.2	547.7	154.3	76.8	41.2	199.9	54.4
Percent	160.0	47.5	.4	21.5	6.1	3.6	1.6	7.8	2.1
Rumania ⁴									
Workers	3,970.6	3,168.9	9.2	368.3	106.8	71.4	50.5	113.3	152.2
Percent	100.0	79.5	.2	7.8	2.7	1.8	1.3	2.6	3.8
Sweden									
Workers	2,601.6	1,058.4	21.4	786.9	217.7	153.6	97.8	182.9	82.9
Percent	109.9	40.7	.8	30.2	8.4	5.9	3.8	7.0	3.2
Switzerland									
Workers	1,861.0	482.8	5.9	821.3	217.2	61.3	98.4	114.6	29.5
Percent	160.0	25.9	.3	44.1	11.7	4.0	5.3	6.2	1.6
United Kingdom (England and Wales only) (1931)									
Workers	18,853.4	1,059.1	1,136.8	7,579.1	3,588.0	1,405.4	798.7	1,806.2	1,419.2
Percent	100.0	5.6	6.0	40.2	19.0	7.9	4.1	9.6	7.6
U. S. S. R.									
Workers	82,528.7	71,565.7	(⁶)	5,015.4	1,165.6	1,263.1	1,889.9	(⁷)	1,906.6
Percent	100.0	86.7	-----	6.1	1.1	1.6	2.3	-----	2.0
ASIA AND AFRICA									
India, British (1931) ⁸									
Workers	148,813.8	66,809.8	346.0	15,351.6	8,116.8	2,341.4	2,310.2	16,898.3	6,615.4
Percent	100.0	67.1	.2	10.3	5.6	1.6	1.6	7.3	6.4
Egypt, ⁹									
Workers	5,840.5	4,014.1	2.7	489.7	280.0	150.7	143.0	201.0	531.4
Percent	100.0	69.2	-----	8.4	4.6	2.6	2.1	3.5	9.1
OCEANIA									
Australia									
Workers	2,320.8	531.0	66.7	723.6	355.0	207.7	151.6	210.0	71.4
Percent	100.0	22.6	2.9	31.2	15.3	6.6	6.5	9.0	3.2
New Zealand									
Workers	511.6	151.0	-----	118.6	79.1	55.4	-----	41.7	64.6
Percent	100.0	29.7	-----	23.2	15.5	10.8	-----	8.2	12.6

¹ Includes in most countries forestry and fisheries.

² Includes those in the merchant marine.

³ Includes army and navy, public administration, and miscellaneous. In the United States the chief component is clerical workers, who, in most other countries, are distributed among other groups.

⁴ Prewar.

⁵ Transportation and communication, and Professions included with All other.

⁶ Mining and quarry included with Manufactures.

⁷ Domestic and personal service included with All other.

⁸ Including Native States.

⁹ 1917.

Source: League of Nations, Statistical Yearbook, 1934-35, Statistical Abstract of United States, 1934.

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